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This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 14081 - 14759.

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AIR POLLUTION ABSTRACTS

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U. S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air Programs

AIR POLLUTION ABSTRACTS

Vol. 2, No. 11 November 1971

Prepared by:

Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711

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Author Index ai-1

Personal authors (maximum of five per document) are arranged alphabetically. The names are presented last name first. The title of the document is indented below the author's name; when the author is the first author of a title, an asterisk precedes the Abstract Number on the next line.

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INTRODUCTION

This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given.

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The serial publications (journals, periodicals, etc.) which are regularly screened for input are listed with their publishers' addresses in one issue in each volume of our abstract bulletin; the most recent list appeared in the December 1970 issue.

As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching—more than those included in the subject index in each issue.

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry—e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development, testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere. Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. **EFFECTS–HUMAN HEALTH**

Covers medical and epedemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. **EFFECTS–PLANTS AND LIVESTOCK**

Effects on vegetation–crops, trees, other plants–and on livestock as distinguished from laboratory experimental animals.

9. **EFFECTS–MATERIALS**

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. **ECONOMIC ASPECTS**

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. **STANDARDS AND CRITERIA**

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. **LEGAL AND ADMINISTRATIVE**

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractural activities and program descriptions.

13. **SOCIAL ASPECTS**

Sociological and psychological aspects such as social attitudes, public opinion studies, public relations, and public information.

14. **GENERAL AND MISCELLANEOUS**

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

14081 **APTIC NO. 31759**

Lear Motors Corp., Reno, Nevada

A REALISTIC EVALUATION OF THE AIR POLLUTION PROBLEM AND THE SUPPORTING MATHEMATICAL ANALYSIS. *37p., 1970 (?). 9 refs.*

Primary sources of air pollution are electric power plants and space heating, industrial plants, and automotive vehicles. The concentration and composition of pollutants vary with the size and area of a population center, with the industry surrounding it, and with climatic conditions. Carbon monoxide and nitrogen oxides are generally found in high concentrations in all major cities of the United States. Health hazards due to air pollutants were discussed. Carbon monoxide interferes with the capacity of blood to transport and release oxygen to the tissues. This interference can impair vision and psychomotor performance. The precise effects of hydrocarbons are not so well known. Some hydrocarbons interact with nitrogen oxides in sunlight, producing odorous smog, eye irritation, and vegetation damage. Nitrogen dioxide is directly toxic to man. Sulfur dioxide is linked with respiratory ailments, asthma, pneumonia, and emphysema. As far as utilities and heavy industries are concerned, stringent policies are being pursued to reduce their contributions to the air pollution. These policies prohibit the use of high sulfur content fuels, shift to natural gas as a fuel when weather inversions threaten, and the use of electrostatic precipitators for chemicals and particulates. The situation of automobile emission appears to be going from bad to worse because of the increasing number of cars and the little or no progress made so far in reducing the emission of pollutants. Federal emission control standards were issued. But there is no assurance that the automobile industry will meet the standards. Alternatives to the internal combustion engine include a steam power propulsion system, electric battery propulsion system, and electric fuel-cell propulsion system.

14082 **APTIC NO. 31762**

National Academy of Sciences-National Research Council, Washington, D. C., Special Advisory Committee on Solid Waste

COLLECTION, REDUCTION, AND DISPOSAL OF SOLID WASTE IN HIGH-RISE MULTIFAMILY DWELLINGS. INTERIM REPORT. *Solid Waste Management Office Contract PH-86-67-167, Rept. EPA-SW-27C.I-71, 167p., 1971. 168 refs.*

NTIS: PB 197623

The results of the first study period of a research program on three alternative methods of handling solid waste in high-rise multifamily housing are presented. Incineration, compaction, and wet pulverization are considered. The objectives and scope of the project, work to be accomplished, method of conducting the project, and test structures used are individually treated. Methods are described for assessing the existing conditions at the test structure. The tentative data-collection equipment program and refuse-handling are discussed. Considered in the assessment of existing conditions were the quantity and composition of refuse generated, number and age of tenants, contribution of the building s incinerators to air pollution, degree of vermin and insect infestation, personnel and power requirements, cost, effectiveness, and limitations, and acceptance by owners, tenants, and custodians. Chute-generated waste, miscellaneous bulky items of refuse, and incinerator residue were surveyed for seven consecutive days. Disregarding the bulky refuse, a total of 10,947 lb of chute refuse, with a volume of 1961 cu ft, was generated, resulting in an overall density of 5.6 lb/cu ft. Per capita generation of chute refuse was 1.48 lb/day per person (adults and children). For adults only, the amount was 4.33 lb/day per person. The percentage by weight and volume of each category of chute refuse is given. Peak refuse generation, by weight, occurred on Saturday, with Sunday a close second. (Author summary modified)

14083 **APTIC NO. 31855**

Scott Research Labs., Inc., San Bernardino, Calif.

INVESTIGATION OF PASSENGER CAR REFUELING LOSSES. (FINAL REPORT). *NAPCA Contract CPA 22-69-68, APRAC Proj. CAPE 9-68, SRL Rept. 2608, Rept. CRC-CAPE-9-68, 99p., March 6, 1970.*

NTIS: PB 195435

A pilot test program and field survey were undertaken to determine hydrocarbon losses from passenger car refueling operations. These losses include displaced fuel tank vapors, entrained fuel droplets in the displaced vapors, liquid spillage, and nozzle drippage. Displaced vapor losses were measured from the two most common fuel tank configurations by the flame ionization detection method; the flame ionization method was also used to measure spill losses. Liquid gasoline drippage measured from the nozzle immediately before and after insertion in the fill pipe was classified as the pre-fill nozzle drip loss and the post-fill nozzle drip loss, respectively. The volume of the liquid collected was measured in a sensitive graduate. To supplement the quantitative data obtained in the laboratory, a survey was conducted to determine the frequency of occurrence of the various types of refueling losses. One segment of the survey consisted of sending a trained observer to various service stations to determine the amount of spitback or overfill and nozzle spillage. The second segment of the survey consisted of obtaining similar data, but with no differentiation between spitback and overfill, when a full tank of fuel was obtained. The following factors were found to affect refueling losses: dispensed quantity, Reid vapor pressure, dispensed gasoline temperature, operator technique, fill pipe design. Tank shape, fill rate, and ambient temperature were found to have no significant effect by themselves.

14084 **APTIC NO. 31858**

Scott Research Labs., Inc., Plumsteadville, Pa.

A STUDY OF EXHAUST EMISSIONS FROM RECIPROCATING AIRCRAFT POWER PLANTS. (FINAL REPORT). *Air Pollution Control Office Contract CPA 22-69-129, Scott Rept. 1136, 88p., Dec. 28, 1970. 6 refs.*

NTIS: PB 197627

The exhaust emissions from nine light aircraft were determined using a nine-mode takeoff-cruise-landing (TCL) cycle. The concentration of carbon monoxide, carbon dioxide, total hydrocarbons, and nitric oxides in the exhaust was measured and fuel consumption rates were determined for each mode. Rate parameters were pounds per pound of fuel, per minute, per TCL cycle, and per landing-takeoff cycle. Design specifications of the test aircraft, specifications for aviation gasolines, analytical techniques, testing equipment and procedures, and data calculations are examined. Data are presented for exhaust concentrations and stack gas temperatures for each of the modes and correlated with cruise altitude, carburetor heat, engine operating time, engine size, and airframe design. Emissions are compared for light aircraft and automobiles. Control techniques and recommendations for future studies are discussed. Exhaust levels for CO for the aircraft were higher than for uncontrolled automobiles and substantially higher than standards set for 1972 vehicle emissions. Hydrocarbon emissions were in the range emitted by current controlled automobiles. Aircraft NO emissions were low except during lean mixture operations. The rich air-fuel mixtures resulted in incomplete combustion, but leaning the mixture to reduce CO and hydrocarbon emissions increased the possibility of engine stalling. Fuel injected engines emitted higher concentrations of hydrocarbons than the normally respirated engines. Exhaust composition differences due to engine age, size, and airframe design were minor. No afterburning of exhaust CO and hydrocarbons was found for any of the aircraft at any mode. Afterburning is discussed as one means of pollution control; thermal and exhaust reactors are also considered.

14085 APTIC NO. 31931

DEVELOPMENT TRENDS IN CRUDE OIL CRACKING. *Chem. Economy Eng. Rev., 3(8):40-42, Aug. 1971.*

Three processes producing olefins from crude oil are described. One of the processes involves heating coke particles 0.5-1.5 mm in diameter. The particles are passed to a reaction tower where they transfer heat to crude oil which undergoes thermal cracking at 750-850 C. Olefins, such as ethylene and propylene, and aromatics, such as benzene and xylene, are obtained. The second hydrocarbon cracking process uses high temperature steam as the heat medium. Components with a lower molecular weight than naphthalene are compressed at 15-20 kg/sq cm. Aromatic oils (chiefly benzene) are first separated by cooling, then, after removal of $C-C_4$ higher acetylenes by scrubbing, acetylene separation of the gas is performed with a solvent. From gas consisting mainly of ethylene approximately 20% ethylene and 98-98.5% acetylene are obtained. From relatively light naphthenic crude oils, components heavier than naphthalene are obtained at a yield of approximately 20%. In the third process, a gas jet is introduced into a fluidized bed of inorganic oxide particles to create a flow of forced circulation of the particles in the bed. With this method, it is possible to raise cracking temperature and to shorten residence time to 0.2-0.3 sec. Typical olefin yields are ethylene, 280 kg/t oil; propylene 120 kg/t oil; butene and butadiene, 85 kg/t oil. Comparison of C_2H_2 production costs are given. Also, these processes incorporate various oil desulfurization features.

14086 APTIC NO. 32181

AIR POLLUTION ASPECTS OF EMISSION SOURCES: MUNICIPAL INCINERATION -- A BIBLIOGRAPHY WITH ABSTRACTS. *Air Pollution Control Office, Research Triangle Park, N. C., Office of Technical Information and Publications, APCO Pub. AP-92, 95p., May 1971. 378 refs.*

NTIS: PB200078

Abstracts pertaining to municipal incineration have been selectively screened from the contents of the Air Pollution Control Office information storage and retrieval system. Emission sources, control methods, measurement methods, and air quality measurements are included. Effects on human health, plants, livestock, materials, and economics, are considered. Standards and criteria, legal and administrative aspects of municipal incineration, and social aspects are presented.

14087 APTIC NO. 32320

Air Pollution Control Office, Research Triangle Park, N. C., Office of Air Programs

AIR POLLUTION ASPECTS OF EMISSION SOURCES: SULFURIC ACID MANUFACTURING. A BIBLIOGRAPHY WITH ABSTRACTS. *Office of Air Programs Pub. 95, 57p., May 1971. 200 refs. 0NTIS: PB 200079*

Approximately 200 abstracts were selectively screened to cover 14 categories of the air pollution aspects of sulfuric acid manufacturing. The compilation is representative of available literature, but is not all-inclusive. The main topics are emission sources, control methods, measurement methods, air quality measurements, atmospheric interaction, and basic science and technology. Other topics include effects on human health, plants, and livestock, materials, and economics, standards and criteria, and legal and administrative. An author index and subject index are also presented.

14088 APTIC NO. 32370

Charles River Assoc., Inc., Cambridge, Mass.

AIRBORNE WASTE. *In: Pollution Control and Management. Chapt. 3, p. 16-23, 1969.*

NTIS: COM-71-00061

A study of airborne wastes in New England resulting from fuel combustion showed that the major wastes produced by combustion of fossil fuels are carbon monoxide (65% of total daily emissions, in terms of weight), sulfur oxides (13%), hydrocarbons (12%), nitrogen oxides (eight percent), and particulates (two percent). Transportation is practically the only activity generating carbon monoxide and hydrocarbons in large quantities in New England. This activity is also responsible for approximately one-third and one-fourth, respectively, of the quantites of nitrogen oxides and particulates attributable to fossil-fuel combustion. Power generation by utilities contributes 44% of the sulfur dioxide, 31% of the particulate and 27% of the nitrogen oxide emissions. Domestic and commercial heating contributes 32% of sulfur dioxide, 30% of nitrogen oxide, and 24% of particulate emissions, while industrial heating and industrial power generation contribute, respectively, 10%, 11%, and 16% of these emissions. Emission levels vary geographically, reflecting the distribution of population in New England. Thus, the problems associated with airborne waste disposal are more intense in Connecticut, Massachusetts, and Rhode Island are less severe in Maine, New Hampshire, and Vermont.

14089 APTIC NO. 32475

Japan Environmental Sanitation Center, Tokyo

REPORT OF SURVEY OF THE SPECIFIED POISONOUS SUBSTANCES AND THE PREVENTION OF OFFENSIVE ODOR. REPORT 4. *(Tokutei yugaibusshitsu narabini akushu boshi ni kansuru chosa kenkyu hokokusho (Dai 4 po)). Text in Japanese. 67p., Aug. 1969. 14 refs.*

The kraft pulp and petro-chemical industries were examined as sources of offensive odors and the actual cotdition of the offensive odor was analyzed. The present state of odorous emissions from these industries, problems, and countermeasures are discussed. The offensive odors produced in the digester process of a kraft pulp industry in Fuji City, Shizuoka Prefecture were measured by a sense organ method, obtained by modifying the odorless chamber. The odors were analyzed by the salt-balanced method, the glass beads tube (selective adsorption of offensive odors), and the low temperature adsorption method (concentration of the odor by liquid oxygen). The volumes of dimethyl-disulfide, hydrogen sulfide, mercaptan, and dimethyl sulfide in the odor were great. Odors analyzed from the recovery boiler in the kraft pulp factories in Miyagi Prefecture contained 1-4 ppm methyl mercaptan, 20-300 ppm hydrogen sulfide, and approximately 1 ppm dimethyl sulfide. The volume of gas emitted at that time was 290,000 cu m. About 1% of methyl mercaptan and dimethyl sulfide was detected from the turpentine tank. Odors from petro-chemical factories in Yamaguchi Prefecture were measured by gas chromatography. The odors were composed of vinyl chloride, 1,3-butadiene, propylene oxide, acetaldehyde, methyl acetate, and ethylene dichloride.

14090 APTIC NO. 32385

Balakrishman, S., D. E. Williamson, and R. W. Okey

STATE OF THE ART REVIEW ON SLUDGE INCINERATION PRACTICE. *Resource Engineering Associates, Wilton, Conn., Federal Water Quality Administration Contract 14-12-499, Program 17070DIV, 135p., April 1970. 61 refs.*

Consierable development in sludge disposal procedures are taking place and sludge handling and disposal is receiving more attention. Sludge handling and disposal is a costly operation and represents 25 to 50% of the total capital and operating cost of a wastewater treatment plant. It is estimated that the volume of waste sludge will increase 60 to 70% within the next 15 years. Sludge handling processes such as incineration and heat drying require pretreatment of sludge. The pretreatment steps include grit removal, blending, thickening, conditioning, and dewatering. The heat value of sludge depends on the amount of combustible elements such as carbon, hydrogen, and sulfur present in the sludge. When chemicals are used in the pretreatment stage, the weight of the sludge increases by about 10% and, because of their inert nature, the heat content of the sludge is reduced. The various incineration processes are discussed in detail, including their performance and operational problems. Incineration is generally more expensive than other sludge disposal systems. The capital and operating cost of incineration systems depends on the type and size of incinerator, nature and amount of sludge, and whether deodorization, dust collection, and disposal are included. Supplemental fuels are invariably required for sewage sludge incineration, but their requirements flucuate depending on the characteristics of the sludge and are reflected in the operating costs. (Author summary modified)

14091 APTIC NO. 31960

Bernhardt, Winfried

STUDIES OF THE NON-EQUILIBRIUM PROCESSES OF THE NITRIC OXIDE REACTIONS IN THE COMBUSTION CHAMBER OF COMBUSTION ENGINES. *(Untersuchungen der Nichtgleichgewichts-vorgaenge der im Brennraum von Verbrennungsmotoren ablaufenden Stickoxidreaktionen). Text in German. Staub, Reinhaltung Luft, 31(7):279-282, 1971. 19 refs. (Presented at the Thermodynamilc Kolloquiums, Wuerzburg, West Germany, Oct. 5-6, 1970.)*

A more complete combustion in spark ignition engines would give less carbon monoxide, nitric oxide, and hydrocarbons. Thy thermal formation of nitric oxide in the combustion chamber was theoretically investigated, and a mathematical model was derived for predicting nitric oxide exhaust concentrations. The essential features of the model are a kinetic mechanism for nitric oxide formation and a thermodynamic analysis of the engine combustion process. The calculations are in agreement with results of spectroscopic determinations in engine cylinders and with predictions of other investigators. (Author summary modified)

14092 APTIC NO. 31882

Blokker, P. C.

AIR POLLUTION BY THE OIL INDUSTRY. *(Luchtbezoedeling door de olie-industrie). Text in Flemish. Meded. Vlaam. Chem. Ver., 32(6):203-212, Nov./Dec. 1970. 14 refs.*

The main potential sources of air pollution from the petroleum industry, excluding the petrochemical industry, are given. The emissions are compared with those from power stations, domestic fuel, and motor traffic. Emissions of nitrogen oxides, hydrocarbons, carbon monoxide, and particulates from the petroleum industry are low in comparison with those arising from other sources. The industry s most important pollutants are sulfur dioxide and odorous gases. Dispersion from high stacks is often an effective means of solving local pollution by sulfur dioxide. For odor abatement, prevention is the best method; examples are given. The problem of abatement cost and norms are briefly discussed. Where health is not impaired, the aim should be a low cost/benefit ratio. The industry is not averse to reasonable norms provided that the level and maintenace are similar in different countries. (Author abstract modified)

14093 APTIC NO. 31916

Brown, B. R.

POSING THE PROBLEM. *J. Inst. Fuel, 53(350):85-91, March 1970. 18 refs.*

The problem of domestic and industrial wastes is discussed. The amount and composition of the former are examined in detail. Also some of the data on which the prediction of future trends might be based are mentioned. Various methods of disposal are considered, and particular attention is given to the large-scale incineration of domestic wastes. A number of the difficulties likely to be encountered in this connection are mentioned. Fine dust and cinders are often emitted by coal burning. However, gas, oil, and electricity are now being used. An attempt at the assessment and classification of industrial wastes is made with a discussion of plastics, paper, cardboard, and organic, gaseous and liquid wastes. Some methods of disposal are examined including composting, dumps and incineration with particular emphasis on those employing combustion processes. A research program into the nature and disposal of the wastes in the United Kingdom is advocated.

14094 APTIC NO. 31927

Brown, Stanley

POWER SUPPLY AND ENVIRONMENT IN GREAT BRITAIN. *Edison Elec. Inst. Bull., 39(4):185-191, July/Aug. 1971. (Presented at the Edison Electric Inst., Annual Convention, 39th, Cleveland, Ohio, June 9, 1971.)*

Experience in the United Kingdom demonstrates quite emphatically that with proper care there is considerably less unfavorable impact on the environment by the provision of necessary energy via the electrical route than by any other. Electricity is, in fact, the only totally non-polluting fuel other than pure hydrogen. Pollution control policy in Britain is cited, and standards of performance are briefly considered. The adoption and development of tall chimneys are reviewed, as well as research activities pertaining to the mechanism of dispersion. Sulfur dioxide and dust are the main emissions. Ecological studies concerning the temperatures of cooling water discharges are also indicated. The subject of amenity -- defined as pleasantness of surrounding -- is considered.

14095 APTIC NO. 32279

Burgasov, P. N.

PROTECTION OF ATMOSPHERE FROM INDUSTRIAL POLLUTION. *(Okhrana vozdushnogo basseyna ot promyshlennykh zagryazneniy). Text in Russian. Zh. Veses. Khim. Obshchestva im. D. I. Mendeleeva, vol. 14:367-372, 1969.*

The sources of atmospheric pollution are surveyed and the connection between pollution degree and meteorological conditions pointed out. Some examples of the harmful effects of a polluted atmosphere on human health and of the economic losses caused by pollution (corrosion and loss of expensive substances through flue gases) are mentioned. Maximum permissible concentrations of 96 pollutants in the atmosphere of inhabited areas in the U.S.S.R. are quoted and some are compared with other countries. The problem of industrial pollution in the U.S.S.R. is discussed in general terms. The sources of pollution in various industrial branches are pointed out, the

solution or existing shortcomings mentioned. Costs of introduced sanitary and hygienic measures are cited.

14096 APTIC NO. 32483

Commoner, Barry, Michael Corr, and Paul J. Stamler

THE CAUSES OF POLLUTION. ***Environment, 13(3):2-19, April 1971. 24 refs.***

Growth in population, per capita consumption, and environmental impact per unit of production are examined as possible factors contributing to the problem of air pollution. United States data for the years 1946-1948 are examined. The change in pollution level for that time increased the range from 200 to 1000%. Population growth, however, was only 43%. The Gross National Product (GNP) increased about 126% and the GNP per capita increased about 59%. The general production classes that increased sharply in per capita consumption included synthetic organic chemicals and the products made from them; wood pulp and paper products; total production of energy; total horsepower of prime movers, especially petroleum driven vehicles; cement; aluminum; mercury used for chlorine production; and petroleum and its products. The increase was in the range of 100 to 1000%, which concurred with changes in the pollution level. The possible contributions of these activities to air pollution are examined and the use of mercury in the chemical process industries is chosen as an informative example.

14097 APTIC NO. 32250

Cooper, Anna Grossman

SULFUR OXIDES AND OTHER SULFUR COMPOUNDS. A BIBLIOGRAPHY WITH ABSTRACTS. ***Public Health Service, Washington, D. C., Div of Air Pollution, Public Health Service Pub.-1093, Bibliography Series 56, 1965, 383p. 1008 refs.***

NTIS: 198103

A bibliography is presented with abstracts of 994 articles pertaining to sulfur oxides and other sulfur compounds. Sources, emission composition, and atmospheric reactions involving oxides of sulfur are included. Human epidemiology, experimental human exposure to sulfur dioxide, and industrial exposures are also considered. Animal epidemiology and experimental animal exposure are treated. Articles have been abstracted pertaining to plant epidemiology and experimental exposure of plants, as well as material damage and visibility reduction. Control devices and methods are also considered. An index is also included according to geographic location.

14098 APTIC NO. 31923

Crosby, Herbert A. and James V. Leonard

CLEAN CARS AND CLEAN SMOKESTACKS -- A MATTER OF SURVIVAL. ***Preprint, Inst. of Electrical and Electronics Engineers, New York, 6p., 1971. 16 refs. (Presented at the Institute of Electrical and Electronics Engineers, Joint National Conference on Major Systems, Anaheim, Calif., Oct. 25-29, 1971.)***

On the assumption that practical and economical electric cars will enter the competitive market within the next four years, the electric power generation industry as it exists today and projections for the period beginning four years hence are examined. The emission of air pollution would be shifted from the highways and urban areas to the smokestacks of the electric utilities, but the installation of pollution abatement devices should make the control of emission easier and more efficient than the attempt to control automobile emissions. However, the use of fossil fuels may be prolonged until more nuclear power plants are built.

14099 APTIC NO. 31832

Elliott, M. A.

ENERGY CONVERSION AND FUEL RESERVES. ***Preprint, American Society of Mechanical Engineers, New York, Fuels Div.; Inst. of Fuel, London (England); Inst. of Combustion and Fuel Technology of Canada, Ottawa (Ontario), p. 6.1-6.25, 1970. 20 refs. (Presented at the North American Fuel Technology Conference, Ottawa, Ontario, May 31-June 3, 1970, Paper ASME-NAFTC-1.)***

A mathematical model has been developed and applied to an analysis of patterns of the future producibility of fossil fuel resources of Canada and the United States. Examples are presented to illustrate how the mathematical model can be adapted to incorporate different assumptions of interest to a user trying to gain an insight into what might occur in the future. Estimates of ultimate fossil fuel resources in various categories in North America are summarized, and these data are used to show the effect of the magnitude of the resource base on patterns of producibility. Attention is directed to the importance of increasing conversion efficiency in our energy system so that our large but finite fossil fuel resources may be conserved. In view of the importance of fluid fuels in the U. S. energy economy, the status of developments for converting solid fossil fuels to the fluid fuels, synthetic oil and high Btu pipeline gas is summarized. (Author abstract)

14100 APTIC NO. 32419

Engdahl, R. B.

INCINERATION OF WASTES. ***Inst. of Fuel, London (England), American Society of Mechanical Engineers, New York, and Inst. of Combustion and Fuel Technology of Canada, Ottawa (Ontario), p. 22.1-22.33, 1970. 29 refs. (Presented at the North American Fuel Technology Conference, Ottawa, Ontario, May 31-June 3, 1970, Paper Inst. F.-NAFTIC-6.)***

Community and industrial wastes are usually incinerated to reduce the volume of the final residue to be handled. Such wastes are largely cellulose and could be used as fuels to generate useful heat. However, their heterogeneous, variable nature, and widely fluctuating moisture content make them inconvenient and difficult fuels to use. The increasing restrictions on allowable particulate emissions from waste burners are forcing widespread reappraisal of conventional refractory incinerators. Their dusty exhaust gases are too hot for most high efficiency gas cleaners. Recovery of useful heat from the gases cools them so that electrostatic precipitators, scrubbers, or filters can be used to remove particulates. Refractory and heat recovery-type firing systems are described. Also some new methods of incineration are discussed. (Author abstract modified)

14101 APTIC NO. 32210

Fare, C. and C. Pollone

TEST FOR DETERMINING THE ACTUAL EMISSION LEVELS OF EUROPEAN AUTOMOBILES. ***(Prove per stabilire i livelli attuali di emissione delle vetture europee). Text in Italian. Assoc. Tec. Automobile A.T.A. Ric., 6(81):1-5, June 1969.***

The European procedure for measuring air pollutants in automobile exhaust was applied, under simulated city traffic conditions, to 300 Italian made cars randomly selected from the road, 83 foreign automobiles selected according to the same criteria, and 74 automobiles whose engines were set according to the manufacturer s specifications. The general results show that, up to a weight of 125 kg, the amount of carbon monoxide in the exhaust increases with the weight of vehicle. Therefore, in Italy, most of the CO due to automobile exhaust is produced by this particular class of vehicles while the contribution of heavier cars is minor. The comparison of the amount of C0 in the exhaust of cars with engines set according to manufacturers specifications and those selected at random

was inconclusive. Thy amount of C0 during minimum running conditions averaged more than six percent and in one tenth of the cars tested, the minimum amount was higher than nine percent, the great variation from one vehicle to another, even in cars of the same model, did not allow the drawing of definite conculusions. The concentration of hydrocarbons in the exhaust did not vary with the weight of the vehicle and was similar for both Italian and foreign cars. In general, engines set according to manufacturer s specifications emitted less HC than engines of automobiles selected at random.

14102 APTIC NO. 31998

Garvey, James R.

AVAILABILITY OF FUEL - COAL. *Preprint, American Society of Mechanical Engineers, Pittsburgh, Pa., Pittsburgh Section, 11p., 1971 (Presented at the American Society of Mechanical Engineers Meeting, Pittsburgh, Pa., Feb. 18, 1971.)*

Coal reserves, which constitute over 70% of total energy reserves in the United States, far overshadow the reserves of all other fuels. The minimum amount of recoverable coal is more than twice the probable minimum recoverable reserves of all other fuels combined. By the year 2000, 50% of power generation would be by nuclear fuel. Natural gas and petroleum will continue to supply about one-third of the fossil fuel demand. Even if annual coal use doubles by the year 2000, only a negligible amount of coal reserves will have been consumed. Oil reserves will have been completely consumed by that time. Natural gas will also have been used up not too long after 1990. Atomic fuel, energy available from atomic fission and fusion, relies on the availability of low-cost fissionable fuel, which is very limited. The light water reactors in operation, under construction, or on order will consume, during their 30-year life, more than twice the reserves of low-cost atomic fuels known to exist in the United States. Future energy requirements can, therefore, only be met through use of coal either as immediate fuel or through conversion to gaseous and liquid hydrocarbons.

14103 APTIC NO. 31809

Garwin, Leo

LIGHT HYDROCARBONS AS MOTOR FUELS. *Hydrocarbon Process., vol. 67:141-144, May 1971.*

Of all light hydrocarbons, methane (as liquefied or compressed natural gas) appears to have the greatest potential as a future motor fuel. It has the highest availability, lowest emissions, highest octane number and Btu efficiency, lowest Btu cost, and supply and distribution problems which are not insurmountable. Exhausts from the combustion of CNG and LNG show ready compliance with standards for hydrocarbons, nitrogen oxides, and carbon monoxide. Because emissions are low in reactivity and engine output matches that of a gasoline engine, propane may be used in fleets in large metropolitan areas. It has no future for passenger cars in long distance driving due to limited supplies and a shortage of refueling stations. Ethane is less available than propane, and butane, whose availability is no greater, has an octane number only about 96 clear.

14104 APTIC NO. 32083

Geras, A.

INFLUENCE OF THE CRUDE FLUXING AGENT USED IN THE BLAST FURNACE PROCESS ON THE SPECIFIC CONSUMPTION OF COKE AND BLAST AS WELL AS ON THE SPECIFIC PRODUCTION OF BLAST FURNACE GAS. *Preprint, 1967. 4 refs. (Presented at the Industrial Power Economy Conference, 5th, Prague, Czechoslovakia, 1967, Paper 1/2-13.) Translated from German. Iron and Steel Inst., London (England), British Iron and Steel Industry Translation Service, 22p., Jan. 1970.*

A mathematical study of a blast furnace simulation model is presented, and losses arising from the fluxing agent added are estimated. Curves showing the changes in blast furnace gas compositon are computed. Elimination of the flux would decrease coke consumption by 444 kg, blast consumption by 1691 cu m, and reduce blast furnace gas volume by 2214 cu m. (Author abstract modified)

14105 APTIC NO. 32165

Gerstle, Richard W. and Timothy W. Devitt

CHLORINE AND HYDROGEN CHLORIDE EMISSIONS AND THEIR CONTROL. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1971. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-25.)*

Chlorine and hydrogen chloride are emitted to the atmosphere by production processes and by various chemical and metallurgical processes. Hydrogen chloride is also emitted by many combustion processes using coal or fuel oil. The major uses for both chlorine and HCl are in the organic chlorination industry, which consumes almost 7.5 million tons of the chlorine and 0.9 million tons of the HCl. Economical operation of these processes requires the recovery and reuse of both chlorine and HCl whenever possible. Chlorine is emitted mainly from its manufacturing and associated handling and liquefaction processes, and in pulp bleaching. Hydrogen chloride is emitted mainly from coal and refuse combustion processes and, to a much smaller extent, from its manufacture and use. Control techniques for chlorine and HCl are well established for chemical processes and use various types of scrubbers with water or caustic as the absorbing solution. Counter-current packed towers are most commonly used to reduce emissions. The disposal of waste liquor from these scrubbers is a problem when in-plant uses cannot be found. Hydrogen chloride emissions from combustion processes are largely uncontrolled. (Author abstract modified)

14106 APTIC NO. 32489

Giever, P. M.

CHARACTERISTICS OF FOUNDRY EFFLUENTS. *Preprint, American Foundrymen s Society, Des Plaines, Ill., 3p., 1970. 7 refs. (Presented at the Total Environmental Control Conference, Ann Arbor, Mich., Nov. 16-19 1970.)*

Effluents from the numerous types of foundry furnaces and products vary over a wide range of physical and chemical characteristics including visible plumes, particulates, irritating fumes, and gases, as well as explosive dusts. Approximately 90% of the gray iron melting furnaces are cupolas and only 15 to 18% of these have air pollution control devices installed. One of the most important characteristics of cupola effluent is the high temperature. In addition to particulates, the effluent from cupolas contains gases which are primarily carbon dioxide and nitrogen with some excess oxygen and varying amounts of sulfur dioxide. Smoke, oil vapor, and fumes make up the remainder of the emissions. Emissions from electric arc furnaces and non-ferrous foundries are also discussed. These include zinc dust, ammonium chloride, carbon monoxide, carbon dioxide, fumes, sulfur oxides, sulfides, sulfates, metal oxides, aluminum oxides, odors, particulates, and many others. Particle size can be an important aspect.

14107 APTIC NO. 32465

Gondim, Pedro M.

CONTRIBUTION OF INDUSTRY TO AIR POLLUTION. *(Contribuicao da industria para a poluicao do ar). Text in Spanish. Rev. Servico Especial Saude Pub., 16(1):69-91, 1971. 13 refs.*

Petroleum refineries, metallurgical processing, and the production of cement are examples of industrial sources of air pollution. These are stationary sources. Mobile sources of air pollution, in particular, the automobile, are becoming an increasing source of problems in urban areas. Automobiles are a product of industry, and industry should be responsible for the control of their emissions. Crankcase and fuel evaporation emissions are under control in the United States, but thermal and catalytic afterburners do not yet satisfactorily control exhaust emissions. In developing countries, such as Brazil, industry is needed, but there are good reasons for also starting an air pollution control program. Pollutants such as sulfur oxides, hydrocarbons, nitrogen oxides, particulates, aldehydes, ammonia, odors, and carbon monoxides are emitted by industry. (Author summary modified)

14108 APTIC NO. 31802

Hancock, J. L., H. G. Applegate, and J. D. Dodd

POLYNUCLEAR AROMATIC HYDROCARBONS ON LEAVES. *Atmos. Environ., 4(4):363-370, 1970. 15 refs.*

An effort was made to determine the relationship of diesel locomotive exhaust to the concentrations of polynuclear aromatic hydrocarbons on vegetation adjacent to a railroad right-of-way. The leaves of Little Bluestem and Post Oak were analyzed by means of thin-layer and gas-liquid chromatography. Anthracene, fluoranthene, pyrene, benz(a)anthracene, and benzo(a)pyrene were identified and quantified. A sixth compound, 3-methylpyrene, was not detected. Higher polynuclear aromatic hydrocarbon concentrations occurred in leaf extracts of plants collected from the control area than from the railroad right-of-way. A comparison of pyrene to benzo(a)pyrene ratios suggested that most of the PAH found on the leaves were products of plant biochemical synthesis and not products of locomotive exhaust. Definite patterns of individual PAH quantities with respect to season were noted.

14109 APTIC NO. 31868

Heller, Austin N., Stanley T. Cuffe, and Don R. Goodwin

INORGANIC CHEMICAL INDUSTRY. *In: Air Pollution. Arthur C. Stern (ed.), Vol. 3, 2nd ed., New York, Academic Press, 1968, Chapt. 38, p. 191-242. 84 refs.*

Air pollution aspects of the manufacture of eight principal inorganic acids and alkalies, phosphate fertilizers, ammonium nitrate, and the two halogens, bromine and chlorine, are discussed. Significant recent changes in process operations and related improvements in control equipment are considered. Hydrochloric acid is produced in the U. S. by three processes: the reaction of sulfuric acid and common salt; by-product recovery from chlorination of organic compounds; and the synthesis of hydrogen and chlorine. All hydrofluoric acid is manufactured by the fluorspar-sulfuric acid process. Wet process and furnace process phosphoric acid production, as well as superphosphoric acid production, are described. Nearly all of the nitric acid manufactured today comes from the catalytic oxidation of ammonia; other processes such as the electric arc, the Wisconsin or nuclear fixation, have not proved to be economically competitive with ammonia oxidation. Sulfuric acid is made by either the chamber process or the contact process. Calcium oxide production is described, while sodium carbonate is manufactured by the Solvay process, the natural or Lake Brines process, and an electrolytic soda ash process. Sodium hydroxide is manufactured by both the lime-soda and electrolytic processes as a coproduct in the manufacture of chlorine. Phosphate rock preparation, normal superphosphate production, triple superphosphate production, diammonium phosphate production, granulation, bulk-dry blending, and mixing are discussed. Neutralization, evaporation, control of particle size and properties, the continuous vacuum crystallization process, and the Stengel process for the production of ammonium nitrate are reviewed. The electrolytic process for the production of chlorine is described, as well as the steam process for natural brines and bitters in the manufacture of bromine. Air pollutant emissions and their control are considered.

14110 APTIC NO. 32035

Horton, Robert J. M.

MAJOR SOURCES OF LEAD POLLUTION. *Public Health Service, Washington, D. C., Symp. Environ. Lead Contamination, 1965, p. 137-142. (Dec. 13-15.)*

NTIS: PB 198104

Air pollution levels for lead at ordinary urban measuring stations show values ranging from one to three micrograms/cu m of air. Rural values are normally below these levels, while measurements taken near automobile traffic may be as high as 40 micrograms/cu m, depending on the proximity to the roadway and traffic density. The average daily diet contains about .3 mg/day of lead, with a range from .1 to two mg. Contamination of drinking water by various sources was reviewed in terms of the Public Health Service drinking water standards of .05 mg/l. Also, a review was made of mostly hitherto unassembled and unpublished data on lead exposure measured by concentrations of lead in air and urine in seven or eight work categories representing the major uses of lead: auto body manufacture and repair, foundries, electrotype printing, storage battery manufacture, rebuilding of storage batteries, and secondary smelters. Lead in tobacco and paints was also considered.

14111 APTIC NO. 31859

Hull, Andrew P.

SOME COMPARISONS OF THE ENVIRONMENTAL RISKS FROM NUCLEAR AND FOSSIL FUELED POWER PLANTS. *Preprint, Brookhaven National Lab., Upton, N. Y., Health Physics Div., 23p., 1971 (?). 31 refs.*

The potential risks of nuclear power plants are considered with respect to three basic assumptions: electricity is a basic necessity; all human interventions related to the extraction and consumption of energy have the potential for both cost and benefit; and fossil or nuclear power plants offer the only practicable methods of meeting the future electrical energy demands. Nuclear power plants are examined with regard to malfunctions and catastophies, routine effluent releases, risk estimates, and thermal effects. Based on annual data of emissions of sulfur oxides, nitrogen oxides, carbon monoxide, hydrocarbons, aldehydes, fly ash, and radium and iodine isotopes from nuclear power and fossil fueled plants, nuclear plants produced less air pollution relative to standards. The principle air effluents from nuclear reactors were fission product noble gases, xenon and krypton. The concentrations of radioactivity in the liquid effluents from nuclear reactor plants were controllable at levels well below radiation protection standards. Contemporary nuclear plants are less thermally efficient than modern fossil plants, but the immediate waste heat problem appears manageable without causing serious environmental problems in large bodies of water. The estimated annual probability of fatal injury from radiation was considerably less than that from natural disasters, fossil-fueled power plants, electricity, firearms, air pollution, smoking, automobiles, and all diseases.

14112 APTIC NO. 32154

Jacobson, Alvin R.

VIABLE PARTICLES IN THE AIR. *In: Air Pollution. Arthur C. Stern (ed.), Vol. 1, 2nd ed., New York, Academic Press, 1968, Chapt. 4, p. 95-119. 55 refs.*

Viable particles in the air consist of several types -- pollen, microorganisms (including algae, fungi, molds, yeasts, smuts, rusts, spores, and bacteria), and insects. Pollens are chiefly 10 to 50 micron in size. Samplers in Albany showed total grass and ragweed pollen each averaged 19% of all the pollen during two years. Also, the type and amount of tree pollens varied from year to year. Many varieties of microorganisms are found in the air, either as individual organisms or attached to some other particulate -- usually dust. Also, approximately 82,500 species of insects are known to exist in the United States, of which 10,000 species are injurious to man in some way. Some insects swarm or migrate in large numbers, such as locusts. Insect parts may be collected in air samples. Temperature, humidity, light, and water supply can cause a fluctuation in the release of airborne pollen. About 55-60% of all pollen is emitted between 4:30 and 8:30 in the morning. Pollen dispersion studies have determined the variation of pollen concentration with the height and distance downward from the source of both tagged and untagged plants tagged with radioactive phosphorus and sulfur. The diurnal pattern of ragweed pollen emission was measured over a three-year period. Wind speed also affects pollen emission and dispersion. Raindrops collect and washout airborne pollens and spores. Aeroallergens can cause much discomfort; hay fever can even cause bronchial asthma. Also airborne infection and contact infection are the two primary method of respiratory disease transmission. Airborne infection is important in the transmission of pulmonary mycoses, such as histoplasmosis, coccidiomycosis, blastomycosis; probably pulmonary tuberculosis; streptococcus; fungous infections; cryptococcosis, nocardiosis; and other diseases. Herbicides can be used to destroy ragweeds and other pollen producing plants. However, ragweed elimination in one area will not necessarily lower the hay fever incidence, because of sporadic exposure to pollen from uncontrolled areas. Ultraviolet irradiation was used to control airborne contagion during a large measles epidemic in 1941. Other preventive measures for airborne diseases include disinfection, dust control measures, masks, fungicides, and cleaning. Insecticides (including fumigants, stomach poisons, and contact poisons) can be toxic to humans.

14113 APTIC NO. 31797

Johnson, Henry

DETERMINATION OF SELENIUM IN SOLID WASTE. *Environ. Sci. Technol., 4(10):850-853, Oct. 1970. 13 refs.*

Selenium was determined to be present in solid waste and related materials. Quantitative measurements were made by spectrophotofluorescence with 2,3-diaminonaphthalene as the reagent. Data are reported on various types of paper, municipal waste, incinerator stack emissions, incinerator quench waters, incinerators residue, and compost samples. Most emphasis was placed on emission of selenium into the environment as a result of incinerating solid waste. The highest concentration observed was 14.5 micrograms/gr of particulate matter collected in a stack emission sample. Maximum values of 0.014 mg/l and 0.023 mg/l were observed for an incinerator residue quench water and an incinerator fly ash quench water sample, respectively. (Author abstract)

14114 APTIC NO. 32052

Kamp, Maurice, T. W. Bivens, and W. L. Dentler

SOURCE EMISSION SURVEY. AIR HYGIENE PROGRAM. MECKLENBURG COUNTY HEALTH DEPARTMENT. 1966. *Mecklenburg County Dept. of Public Health, Charlotte, N. C., Mecklenburg County Dept of Public Health, Charlotte, N. C., Environmental Health Div.; and Mecklenburg County Dept. of Public Health, Charlotte, N. C., Air Pollution Div., 91p., 1966.*

Source emission data are presented for Mecklenburg County, North Carolina. Emissions from the combustion of fossil fuels are indicated, as well as aircraft and motor vehicle emissions. Various emissions from the combustion of natural gas, light and heavy fuel oils, bottled gas, and coal are listed tabularly. Emissions from various industries include power plants, asphalt plants, foundries, dry cleaning plants, and other sources. The distribution of fuel use is indicated. The questionnaires used are included.

14115 APTIC NO. 32223

Kassasow, P., M. Argirowa, and Z. Kamenow

AIR POLLUTION IN THE AREA OF COMBINED CHEMICAL WORKS. *(Die Verunreinigung der atmosphaerischen Luft im Gebiet eines Chemiekombinates). Text in German. Wiss. Z. Humboldt Univ. Berlin Math. Naturw. Reihe, 19(5):519-521, 1970.*

Air quality measurements were made in an inhabited area near a chemical plant during 1965 to 1967, prior to the start-up of the plant, and throughout 1968, its first year of operation, to establish its effect on atmospheric concentrations of ammonia, carbon monoxide, hydrocarbons, and mercaptan. The plant, which produces urea, uses as raw material and as fuel for the power station natural gas which contains 90% methane, 5% ethane, and a number of other gaseous components, including also some unsaturated hydrocarbons. The maximum recorded ammonia concentration was 0.20 mg/cu m in 1966, and 2.4 mg/cu m in 1968. For hydrocarbons the maximum figure in 1968 was 36 mg/cu m, compared with almost zero in 1966. Other maxima in 1968 were 27 mg/cu m for unsaturated hydrocarbons, and 13 mg/cu m for carbon monoxide. No mercaptans were found in the air samples. The recorded ammonia concentrations exceeded the admissible concentrations by up to 20 times. The chemical plant was thus concluded to be a source of air pollution from ammonia, carbon monoxide, and hydrocarbons, which were most concentrated in the direct vicinity of the factory. It was found that breakdowns in the production process and equipment leakages were distinctly noticeable in the degree of air pollution.

14116 APTIC NO. 32142

Koyama, Tadashiro

GASEOUS METABOLISM IN LAKE SEDIMENTS AND PADDY SOILS AND THE PRODUCTION OF ATMOSPHERIC METHANE AND HYDROGEN. *J. Geophys. Res., 68(13):3971-3973, July 1, 1963.*

A basic knowledge of the reduction process occurring in the waterlogged paddy soils is important in the study of microbiological metabolism in soils or sediments. Suitable amounts of air-dried soil and water were taken in a special injector, and the mouth of the injector sealed. A number of injectors were placed in an incubator set at 35 C. At suitable intervals, the injectors were removed to determine the rado potential and the quantities of manganese, iron, ammonium ions, nitrate, nitrite, and sulfide. Gases were determined by gas chromatography, organic acids by silica gel partition chromatography. In the early stage of the incubation process, dissolved oxygen was consumed within one day, and the redox potential dropped rapidly. Nitrate and nitrite were reduced to nitrogen. Manganese (4+) was reduced to Mn(2+). Iron (3+) was reduced to Fe(2+). Sulfate was reduced to sulfide. Hydrogen and methane were produced. The values of both total carbonate matter and organic acids increased in the early stage, reached a maximum almost simultaneously, and then decreased. This period of decrease equals the period when the CH4 fermentation was vigorously active. This suggests that CH4 may be produced from carbon dioxide or organic acids in soils. Another experiment was conducted to determine the mechanism of CH4 fermentation. Pressure increase has no effect on fermentation.

14117 APTIC NO. 31919

Krause, Urszula and Janina Wasilewska

EMISSION OF AIR POLLUTANTS DURING THE SMELTING OF IRON ORE IN THE DL SYSTEM. *(Emisja zanieczyszczen atmosfery przez spiekalnie rud zelaza systemu DL). Text in Polish. Wiad. Hutnicze (Katowice), 27(4):105-110, 1971. 10 refs.*

The total quantity of dust emitted into the atmosphere from iron ore smelting plants operating a Dwight Lloyd system is generally high in Poland and averages 2893 tons per year or about 0.31% compared to the production of agglomerates. Multicyclic dust collectors placed at strategic sites along the two conveyer belts are only 77% efficient, mainly because the dust particles released are very small approximately 84% of the particles are less than 20 millimicrons in size. Multicyclic collectors, installed for removing dust from gases released at the breaking junctions of the smelting conveyer belts and at the casing of the conveyer belts returning agglomerates, are more efficient than those at other sites, because gases at these points have a fourfold increase in the dust concentration before they reach the multicyclic apparatus. Despite the 84% efficiency at these sites, the average dust concentration in the released gas is 1328 mg/n cu m, yielding an emission of 124 kg/hr or 931 tons/yr. The chemical composition of the dust includes iron metals (38%), silicon dioxide and calcium oxide (11.12%), and calcium carbonate (11.8%). The quantity of sulfur dioxide in the gases emitted from the plants is also very high, averaging 7530 tons per year. To overcome these deficiencies, installation of an electrostatic precipitator is recommended. Poland does not have its own standards for controlling industrial air pollution and applies the norms established by other countries which vary widely in the permissible amounts of dust and sulfur dioxide.

14118 APTIC NO. 32040

Krause, U. and J. Wasilewska

INVESTIGATIONS OF DUST AND SULPHUR DIOXIDE EMISSION INTO THE AIR FROM VARIOUS DEPARTMENTS OF STEELWORKS. *Hutnik (Prague), 36(3):128-132, 1969. 7 refs. Translated from Polish. Iron and Steel Inst. London (England), British Iron and Steel Industry Translation Service, 9p., Oct. 1969.*

A steelworks manufacturing finished products and using natural gas as its main fuel was monitored for emission of pollution in flue gases. Emissions of dust and sulfur dioxide in smoke and fumes were measured from an electric furnace, open-hearth furnace, cupola, reverbatory furnace, and drying installations at the iron foundry and steel foundry manufacturing rolling-mill rolls, all potential sources of emission of a steelworks. Dust concentration was measured by sampling, and the amount of SO2 in the fumes was determined by the iodimetric method. The principal emission sources were the electric furnace in the roll-casting foundry, the open-hearth furnace in the roll-casting plant, and the cupola. The reverbatory furnace and the drying ovens discharged only small amounts of dust into the air. The total dust emission from all steelwork emission sources was 51.6 kg/hr (250.5 Mg/t/year). The total SO2 emission was about 671 g/hr (approximately 3.2 Mg/t/year).

14119 APTIC NO. 32492

Kumashiro, Kazuo and Masana Ogata

THE EARTH SURFACE POLLUTION BY LEAD AT CROSSROADS. *(Kosaten ni okeru doro dojo no namari osen). Text in Japanese. Igaku to Seibutsugaku, 82(3):89-91, March 10, 1971. 4 refs.*

Lead and potassium were determined in soil alongside heavily traveled roads, moderately traveled roads, and roads with little traffic in Okayama City. The traffic volume was 3000-4000 cars/hr in the first group, 500-1000 cars/hr in the second group, and 0-10 cars/hr in the third group. Significant differences were not found concerning the potassium content of the soils from the three different groups. The mean lead content was 480 ppm for the first soil group, 110 ppm for the second group of samples, and 30 ppm for the third group.

14120 APTIC NO. 31904

Lagarias, J. S. and R. A. Herrick

IMPACT OF ENERGY CONSUMPTION ON THE AIR ENVIRONMENT. *Am. J. Public Health, 61(7):1416-1424, July 1971. 13 refs. (Presented at the American Academy of Environmental Engineers and the American Public Health Association, Environment Section, Annual Meeting, 98th, Houston, Tex., Oct. 26, 1970.)*

As a result of the combined effect of increasing population and increasing per capita use of energy, the electrical generating capacity of the United States has doubled every decade since World War II. Energy requirements are expected to increase in the U. S. by 260%, from the 1970 level of 64,300 trillion BTUs per year to a 2000 level of 168,600 trillion BTUs per year. The total energy consumption forecast by fuel and consuming sector is shown, and utilities are indicated to be the dominant energy consumer in the foreseeable future. The consensus seems to be that by the year 2000, nuclear and fossil fuel generating plants will be supplying approximately equal amounts of electricity to meet the needs of the economy at that time. The major energy source in the U. S. has been and will continue to be liquid petroleum products; this includes oil and liquefied natural gas. Air pollutant emissions include particulate matter, sulfur oxides, nitrogen oxides, hydrocarbons, and carbon monoxide. Flue gas desulfurization and advances in technology are mentioned. Other emission sources such as transportation, fuel combustion, industry, solid waste disposal, and fires were also mentioned.

14121 APTIC NO. 32351

Lemke, Eric E., George Thomas, and Wayne E. Zwiacher

PROFILE OF AIR POLLUTION CONTROL IN LOS ANGELES COUNTY. *Los Angeles County Air Pollution Control District, Calif., 66p., Jan. 1969.*

A profile of air pollution sources, the effectiveness of the control program, and a projection for the future in Los Angeles are presented. The Federal Clean Air Act of 1967 figures prominently in the future projections, because it is assumed that California will set motor vehicle emission standards more stringently than the Federal standards. About 13,500 tons of air contaminants are still being emitted daily, primarily because of automobile emissions which comprise approximately 90% of the uncontrolled emissions. Major sources are listed with data on type and amounts of particulates emitted, and the amounts prevented. Motor vehicle sources include exhaust, blowby, and evaporation in gasoline-powered engines and diesel-powered engines; the prevention methods for motor vehicle emissions include crankcase and exhaust control. Other sources include organic solvents (surface coating, dry cleaning, and degreasing), chemicals (sulfur and sulfuric acid plants), incineration, non-ferrous metal production, cupolas, electric steel furnaces, open hearths, mineral production (including asphalt), and petroleum (refining, marketing, and production). Rule 62 prevents contamination from power plants and other fuel combustion processes. Jet and piston driven aircraft, ships, and railroads are also sources. Contaminants include nitrogen oxides, sulfur dioxide, carbon monoxide, hydrocarbons, and particulates. The distribution of chemical processing equipment, boilers, heaters, paint bake ovens, incinerators, metal melting equipment, concrete batch plants, petroleum processing equipment, rendering equipment, and power plant boilers are shown. Daily emissions from fuel oil, natural gas, and refinery make gas are shown. Also, steam and electric power plants are discussed. When motor vehicle exhaust reacts with the air, photochemical smog can be formed which causes eye irritation; the California Pure Air Act has set standards which should eliminate this. Stationary and mobile sources, air monitoring stations, seasonal changes, ozone concentrations, wind effects, daily concentration levels, oxidant levels, and alerts are also discussed.

14122 APTIC NO. 31965

Maddox, R. N.

CONVENTIONAL SWEETENING PROCESS. *Natural Gas Processors Assoc., Tulsa, Okla. Proc. Nat. Gas Process. Assoc., Ann. Conv., 49th, Denver, Colo., 1970, p. 98-103. 14 refs.*

Criteria to be considered in selecting a natural gas treatment process include impurities in the gas, the concentration of impurities, degree of removal required, and the feasibility of sulfur recovery. Most, but not all, of the processes involving chemical reaction use reactants that undergo reversible reactions with hydrogen sulfide and/or carbon dioxide; however, some processes utilize reactants which act irreversibly with sour gas constituents. The alkanolamines constitute the most widely used of the chemically reactive absorbents. Process flow in the hot potassium carbonate process is similar to the amine process. However, in the hot carbonate process, the absorber operates at essentially the same temperature level as does the stripper. The iron oxide process is generally restricted in application to relatively low gas volumes with low hydrogen sulfide content. In 1960, patents were issued covering the use of organic solvents-propylene carbonate, glycerol triacetate, butoxy diethylene glycol acetate, and methoxy triethylene glycol acetate when used for absorption of carbon dioxide from high pressure gas streams. All of these solvents absorb the acid gases by physical solution and permit solvent regeneration by simple release of pressure heat application. A type of solids process which falls into the physical sorption range is that using molecular sieves. The Shell sulfinol process and the Lurgi Purisol process combine the advantages of chemical reaction and physical absorption.

14123 APTIC NO. 31935

Nakamura, Keigo

ON AIR POLLUTION CAUSED BY HYDROGEN FLUORIDE. *(Fukka suiso ni yoru taiki osen ni tsuite). Text in Japanese. Kogai To Taisaku (J. Pollution Control), 6(4):50-58, July 1971. 9 refs.*

When the atmosphere contains as little as 10 ppb of hydrogen fluoride, crops can be damaged, because the HF is accumulated in the leaves. Teeth and bones are also affected when cattle eat feed containing 30-50 ppm HF over an extended period of time. Fluoride emissions are issued from plants which process ores containing fluoride compounds. Steel mills in Japan are using about four kg fluorspar/ton steel. Various types of scrubbers are utilized to recover fluoride from aluminum smelter and phosphorus fertilizer exhaust gases. Collectors are then used to trap fluoride and sulfuric acid mists.

14124 APTIC NO. 32128

Nichols, R.

ETHYLENE PRODUCTION DURING SENESCENCE OF FLOWERS. *J. Hort. Sci., vol. 41:279-290, 1966. 14 refs.*

A method of determining ethylene production by detached flowers is described. A surge of ethylene was shown to accompany the wilting of carnations at the end of senescence. This surge is independent of fungal infection and it was concluded that in the infected flower the major source of ethylene production is the host tissues. A similar surge of ethylene production was observed when the inflorescence wilts on the plant between 20 and 40 days from flower opening. At temperatures above 7.2 C, the ethylene surge was accompanied by collapse of the petals and rapid loss of water. Cut flowers kept continuously below 7.2 C slowly declined in weight, the petals became flaccid, and ethylene production was negligible. Infection of the flowers with fungus did not materially alter the effect of temperature on the ethylene production. (Author summary modified)

14125 APTIC NO. 31934

Ohira, Toshio, T. Komeiji, Y. Igoshi, K. Asakova, T. Kubodera, T. Yamamoto, and Z. Shinozaki

MEASUREMENT OF LEAD AND AROMATIC HYDROCARBON IN GASOLINE. *(Gasolin chu no namari oyobi hokozoku tanka suiso no sokotei). Text in Japanese. Taiki Osen Nyusu (Air Pollution News), no. 65:4-6, July 1971.*

Benzene, toluene, and the other aromatic hydrocarbons contained in gasoline have been implicated as one of the causes of photochemical smog. Major gasoline blends on the market were tested to determine to what extent they contained tetraethyl lead, aromatic compounds, and thinner. It has been suggested that aromatic compounds are added to gasolines to maintain octane as lead compounds were removed. The lead standard (less than 0.3 ml/liter) was met for all brands, and, except for one or two brands, there was no marked difference in aromatic hydrocarbon content between the gasolines. Since the blend with a high concentration of aromatic hydrocarbons also had a high lead concentration, it was concluded that aromatic compounds were not added intentionally. No thinner was added to the various blends.

14126 APTIC NO. 31753

Olotka, F. T., B. J. Carreno, and J. N. Brogard

NEW CHEMICAL PLANT POLLUTION EVALUATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1971. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-16.)*

The evaluation of air pollution control requirements for a semi-commercial chemical processing facility is described. The sales and marketing groups must accurately forecast the customer demand for a product so the plant can be properly sized. Once plant capacity is established, the research, development, and engineering groups must develop flow sheets and material balances that show as precisely as possible the content of all waste streams. The pollution control group must accurately evaluate all waste streams in terms of current and future control standards. This is essential so abatement systems can be properly designed and cost estimated. The financial analysis group must then feed this cost into their evaluation of the project. Once all the monetary factors are defined and evaluated, the project is then submitted to management for review and action. The environmental considerations are an important factor in getting management approval for a new plant. If they are carefully and properly evaluated, the monies can be spent wisely. Then the processing installation can be constructed and operated in the most profitable and pollution-free manner. (Author conclusions modified)

14127 APTIC NO. 32130

Ostlund, H. Goete and James Alexander

OXIDATION RATE OF SULFIDE IN SEA WATER, A PRELIMINARY STUDY. *J. Geophys. Res., 68(13):3995-3997, July 1, 1963. 2 refs.*

Previous results indicated that sea-water spray can constitute only a minor source of airborne sulfate. The principal origin of this sulfate must be from organic materials and volcanic activity. Sea water may release hydrogen sulfide produced in bottom sediments. After hurricane Donna in September 1960, measurements of sulfur and oxygen in the Florida Bay area of the Everglades National Park yielded puzzling results. Experiments were then initiated to determine the rate of oxidation of dissolved hydrogen sulfide by dissolved oxygen in sea water by adding hydrogen sulfide solution to normal sea water. Changes in sulfide concentration were monitored with an Ag/Ag2S electrode; the pH was also monitored. Whatever the reaction mechanism, the sulfide appeared to decrease with a rate constant of about 0.0002/micro M min at about 25 C, calculated as a second order reaction. In sea water having a constant oxygen content of 170 micro M (3.8 ml/l), the half life for hydrogen sulfide would be about 20 minutes. It is therefore unlikely that hydrogen sulfide can survive long enough to penetrate from the bottom of the sea to the atmosphere, except in very shallow areas. (Author abstract modified)

14128 APTIC NO. 31737

Petry, Jan Krzysztof

GENERAL OBSERVATIONS ON THE APPLICATION OF SELENIUM (SE) IN INDUSTRY AND THE HISTORY OF ITS DISCOVERY. *Przeglad Lekar., 26(4): 452-453, 1970. 10 refs. Translated from Polish. Mundus Systems, McGregor, and Werner, Inc., Washington, D. C., 7p.*

Applications of selenium in industry are cited, and its effect on the living organism is mentioned. Selenium is used in the steel industry, since it resists abrasion and prevents corrosion. It is used in the production of inks and dyes for coloring plastics and textiles. Also, selenium is a component of insecticides, and permits the proper gradation of colors in photography. The cosmetic industry introduced selenium into hair shampoo. Due to the presence of selenium in the soil, some water and plants have been polluted; it eventually found its way into animals and humans, leading to morbid conditions and numerous deaths. Cases of poisoning to horses are cited.

14129 APTIC NO. 32180

Rasmussen, R. A.

QUALITATIVE ANALYSES OF THE HYDROCARBON EMISSION FROM VENEER DRYERS. *Washington State University, Pullman, Air Pollution Research Section, Air Pollution Control Office, Research Grant AP 1232, 17p., 1970.*

Routine gas chromatographic analyses of the volatile hydrocarbons in the stack gas at veneer-drying operations showed that alpha-pinene was the major monoterpene emitted. Alpha-pinene is a reactive hydrocarbon and participates in the same atmospheric photochemical reactions that produce the irritating compounds associated with smog. During the drying of Douglas fir, alpha-pinene accounted for 75-90% of the monoterpene emission, and for ponderosa pine, 40-50%. The monoterpene composition of the stack gas was characteristic of the wood species being dried. However, the concentrations were not as characteristic as the composition. Following a preliminary study of the condensed hydrocarbon fraction, a tentative identification of the bulk of the condensate as abietic acid was made. Sesquiterpenes, fatty acids, resin esters, and resin alcohols are also indicated to be present. The blue haze caused by veneer-drying operations of the plywood industry is recognized as a serious air pollution problem. (Author conclusions modified)

14130 APTIC NO. 32105

Ross, F. Fraser

WHAT SULPHUR DIOXIDE PROBELM? Combustion, 43(2):6-11, Aug. 1971.

If all the 60 million tons of sulfur dioxide predicted for 1980 in the U. S. were emitted and mixed with air over nine million sq km to the equivalent depth of four km, the ground-level SO2 concentration would be 1.67 tons/cu km or 1670 microgram/sq m. During the year, however, the concentration is subject to washout by rain, absorption at the ground, and dispersion in a large air mass. If the average residence time due to all these effects is about 10 days, the figure is 45 microgram/cu m; if only five days, 23 microgram/cu m. A limit of one percent sulfur in fuel should not be placed on installations large enough to disperse gases well above breathing level. Fuel burned in cities should be restricted to the lowest practical sulfur content (0.3 or 0.5%), but large installations should be allowed the use of residual oil with up to 3.5% sulfur or coal with about 2.5% sulfur. When the coal has a higher sulfur content, it should be washed or subjected to partial pyrites removal integrated with pulverization. If stacks were limited to 500 ft (e.g., airport sites), residual oil with less than two percent sulfur, or coal with one and one-half percent sulfur could be used. These restrictions would reduce sulfur dioxide emissions to tolerable levels without depriving vegetation of needed sulfur.

14131 APTIC NO. 32240

Sawyer, Robert F.

EMISSIONS CHARACTERISTICS OF VEHICULAR GAS TURBINE ENGINES. *Preprint, American Society of Mechanical Engineers, New York, 12p., 1970. 8 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, New York, Nov. 30, 1970.)*

The increasing demand for a very low air pollution emission power plant for land vehicles may accelerate a widespread utilization of gas turbine engines. Unlike turbojet engines, with their severe limitations on size and weight and their requirements for stability of operation over a range of operating conditions, the vehicular gas turbine should not be plagued by a particulate or smoke emissions. Carbon monoxide, hydrocarbons, and nitric oxide are the dominant pollutants emitted from gas turbines. Engine emission characteristics are considered, emission standards, and gas turbine operation, regeneration, and combustor design. The only difficulty is with nitric oxide, and a combustor design solution to this problem appears possible.

14132 APTIC NO. 32375

Schmitt, C. R.

THERMAL DEGRADATION AND TOXICITY ASPECTS OF VARIOUS POLYMERIC MATERIALS. *Union Carbide Corp., Oak Ridge, Tenn., Oak Ridge Y-12 Plant, Atomic Energy Commission Contract W-7405-eng-26, Rept. TID-4500, UC-4, 25p., June 9, 1971. 15 refs.*

NTIS: Y-1734

The thermal degradation characteristics of a flexible polyurethane foam, two polyethylene trash containers, and a polystyrene packaging material were evaluated by thermogravimetric, mass spectrographic, and emission spectrographic analyses with regard to the toxic gaseous products evolved. Mass spectrographic analyses of vapors liberated from the polyurethane foam at melting temperature and just prior to ignition showed that toxic hydrogen cyanide was present. After ignition, the hydrogen cyanide content of the gaseous degradation products increased greatly. (Author summary modified)

14133 APTIC NO. 31898

Schwanecke, Rudolf

EVAPORATION LOSSES FROM FLUID TANKS. *(Verdampfungsverluste aus Fluessigkeitstanks). Text in German. Wasser Luft Betrieb, 15(7):254-258, July 1971. 4 refs.*

Any consideration of air pollution must include evaporation losses from tanks for storage of inflammable fluids. Above the fluid in each tank is an amount of gas. If the level of the fluid remains constant while ambient temperature and tank temperature change, the volume of the gas will also change. The volume change of the fluid is negligible. Evaporation losses for a sturdy roofed tank are calculated with a formula. Additional losses develop at sudden changes in fluid level. Evaporation losses can be avoided by adjusting valves so that they do nt open with a pressure change inside the tank. The required actuation pressure for the valve is calculated with following variables: the opening pressure of the underpressure valve in mm Hg, the opening pressure of the overpressure valve in mm Hg, the atmospheric pressure, product vapor pressure at lowest temperature, product vapor pressure of the product at the highest temperature, the lowest fluid temperature, the highest fluid temperature, and the vapor space volume at highest/lowest temperature.

14134 APTIC NO. 31730

Sforzoline, G. Scassellati and A. Savino

EVALUATION OF A RAPID INDEX OF AMBIENT CONTAMINATION BY CIGARETTE SMOKE, IN RELATION TO THE COMPOSITION OF THE GAS PHASES OF THE SMOKE. *Riv. Ital. Igiene (Pisa), 28(1/2):43-55, Jan./April 1968. 35 refs. Translated from Italian. Herner and Co., Washington, D. C., 14p.*

Side-stream cigarette smoke (that dispersed to air in the period of non-aspiration) and main-stream cigarette smoke were analyzed for the presence of carbon monoxide, carbon dioxide, nitrogen oxides (nitric oxide + nitrogen dioxide measured as NO2), and ammonia. The determinations were made for three types of cigarettes without filters and for three types with filters. Measured concentrations of the toxic gases, particularly CO, were high in both types of smoke. The mainstream smoke of five cigarettes contained almost the maximum allowable concentration (MAC) of CO/cu m air. The results for side-stream smoke suggest that the MAC of CO can easily be reached in an automobile in which a pack of cigarettes has been smoked with the windows open. Carbon monoxide in smoke of filter cigarettes showed a regular increase from the beginning to the end of the cigarette. For non-filter cigarettes, the concentration decreased toward the end of the cigarette after increasing in the middle of the cigarette.

14135 APTIC NO. 31883

Sherwood, R. J.

TRENDS IN THE REFINERY ENVIRONMENT. *Med. Bull. Standard Oil, New Jersey, 31(2):142-156, July 1971. (Also: Petrol. Rev., Feb. 1971.)*

The universal requirement for planning authorization ensures that environmental factors are considered in the location, planning, and operation of new refineries. In almost all environmental matters, the principle criterion is amenity, not health. Sometimes it may concern economy (for example, damage to growing crops or fisheries), and a simple economic criterion can then be developed. Where the basis for environmental control is clearly that of human health, this will transcend economic considerations and considerable attention must be given to effective evaluation and control. Amenity aspects are more difficult to assess and are likely to become more stringent with rising living standards; they are particularly influenced by the situation of any particular refinery. Potential problem areas in the external and internal environment of a refinery are identified. Among the former are air pollution, neighborhood noise, flares, water and ground pollution, and accidental discharge of hazardous substances. Internal problems include exposure of the isolated worker to toxic substances and noise, lighting, and thermal conditions.

14136 APTIC NO. 32188

Starkman, E. S.

THEORY, EXPERIMENT, AND RATIONALE IN THE GENERATION OF POLLUTANTS BY COMBUSTION. *Intern. Symp. Combustion, 12th, Poitiers, France, 1968, p. 593-601. 40 refs. (July 14-20.)*

Mechanisms currently believed responsible for the production of carbon monoxide, nitric oxide, and unburned hydrocarbons in combustion engines are delineated. Equilibrium considerations fail to explain adequately the phenomena encountered, particularly at fuel-lean mixtures. Chemical kinetics appear to be controlling, with reaction rate playing an important role. An absence of reliable kinetic data precludes accurate prediction of exhaust-gas concentration. Difficulties arise in suppressing the three main exhaust pollutants simultaneously since rich mixtures increase hydrocarbon and carbon monoxide concentrations and lean mixtures result in nitric oxide. Three approaches to this problem are noted.

14137 APTIC NO. 31880

Steigerwald, Bernard J. and A. H. Rose

ATMOSPHERIC EMISSIONS FROM PETROLEUM REFINERIES. A GUIDE FOR MEASUREMENT AND CONTROL. *Public Health Service, Cincinnati, Ohio, Div. of Air Pollution, PHS Pub.-763, 56p., 1960. 11 refs.*

NTIS: PB 198096

The process of petroleum refining and atmospheric emissions from oil refineries were discussed. General information on the processes and equipment used in oil refineries to manufacture petroleum products was given. Crude oil distillation, conversion by cracking, catalytic reforming, polymerization, alkylation, isomerization, treatment with hydrogen and chemicals, and blending were also briefly described. Sources of emission from oil refineries include storage tanks, catalyst regeneration units, pipeline valves and flanges, pressure relief valves, pumps and compressors, compressor engines, cooling towers, loading facilities, waste water separators, blowdown systems, boilers, process heaters, vacuum jets, sampling, air blowing, and acid treating. The main emissions are sulfur oxides, nitrogen oxides, hydrocarbons, carbon monoxide, and malodorous materials. Lesser emissions include particulates, aldehydes, ammonia, and organic acids. The most important factors affecting refinery emissions are crude oil capacity, air pollution control measures, general level of maintenance and good housekeeping in the refinery, and the processing scheme employed. The estimation of atmospheric emissions from oil refineries was demonstrated.

14138 APTIC NO. 31897

Thompson, Theos J.

POWER NEEDS AND POWER PROBLEMS – PAST, PRESENT, AND FUTURE. *Am. J. Public Health, 61(7):1406-1415, July 1971. 4 refs. (American Academy of Environmental Engineers and the American Public Health Association, Environment Section, Annual Meeting of the Joint Session, 98th, Houston, Tex., Oct. 26, 1970.)*

Power reserves in many regions are already below the 15-20% considered adequate by the Federal Power Commission. However, the prospects for commerical development and exploitation of nuclear breeder reactors capable of consuming natural uranium and thorium are good. Radiation releases from nuclear power plants will be limited by the Atomic Energy Commission to a fraction of the Radiation Protection Guides recommended by the Federal Radiation Council and to levels that will have no perceptible adverse effects on the ecology. Experience with light water-cooled reactors shows radioactivity in water and air effluents from the plants is generally less than a few percent of the limits specified by AEC regulations. No dangerous levels of radionuclide concentrations have been observed in food chains leading to man. Current technical processes assure adequate management of radioactive waste materials from nuclear plants. Technologies under development may permit the capture of radioactive gases in reactors and processing plants. Since they release no combustion products to the atmosphere, nuclear plants will contribute substantially to the fight for clean air. They will also help conserve reserves of coal and petroleum products.

CONTROL METHODS

14139 APTIC NO. 31794

OXYGEN TREATING IS PROVING FEASIBLE. *Can. Chem. Process., 55(4):52-54, 56, April 1971.*

Among newer techniques being groomed for use in the pulpmill are soda-oxygen pulping, oxygen bleaching of pulp, and other oxidation systems using oxygen instead of air. One result of such wide use of oxygen would be the need for a tonnage oxygen (air separation) plant at or near most pulp and paper complexes. With tonnage oxygen available, it becomes feasible for existing kraft mills to conduct oxidation of black liquor with oxygen and hence automatically reduce the amount of malodorous off-gases produced in the chemical-recovery system. Similarly, existing biological treatment plants for wastewater could be upgraded in operation through the use of oxygen instead of air as the aeration medium. The use of an oxygen stage and the consequent reduction in chlorine charge to the bleachery introduces the possibility of lowering bleachery pollution by over 50%. Operating variables at several plants are mentioned.

14140 APTIC NO. 31803

ENVIRONMENTAL FORECAST: INCREASED PRECIPITATION. *Chem. Week, 109(7):77-78, 80, 82, Aug. 18, 1971. 1 ref.*

In the past five years, the range of application of electrostatic precipitators has been extended from atmospheric pressure to as high as 825 psi and from temperatures below 900 F to 1700 F. Precipitators are also being designed to handle dust concentrations from 0.00001 grains/std cu ft to 156 grains/std cu ft and efficiencies over 99%. Coal-burning electric stations, the steel industry, the pulp and paper industry, and contact sulfuric acid plants continue to be important markets for electrostatic precipitators. Precipitators are also used in processing cement and gypsum. New or potential fields of application include Wulff acetylene production, removal of lube oil mist from gas pipelines, shale-oil processing, and coal gasification.

14141 APTIC NO. 31987

EQUIPMENT INVESTMENT FOR HEAVY OIL DESULFURIZATION. *Chem. Economy Eng. Rev., 3(8):37-39, Aug. 1971.*

Of the 16 heavy oil hydrodesulfurization plants now in operation or under construction in Japan, only three are based on the atmospheric residual hydrodesulfurization process, i.e., direct desulfurization. The remainder employ the vacuum gas oil hydrodesulfurization process, i.e., indirect desulfurization. More direct desulfurization plants are needed to meet the target date for desulfurization of heavy oil, and plants to be built under long-range plans for 1975 are, almost without exception, of the direct desulfurization type. Problems remaining to be solved include those of catalytic activity, life, and cost, as well as costs of construction and operation (especially for hydrogen production). Since the present limit of 1.0 to 1.5 wt% for direct desulfurization will not meet the future demand for low-sulfur heavy oil, it will be necessary to mix effluent or residual oil produced from low-sulfur crude and to mix low-sulfur heavy oil raw material from indirect desulfurization.

14142 APTIC NO. 32057

Nordrhein-Westfalen Arbeits-und Sozialminister (West Germany)

TECHNICAL POLLUTION CONTROL MEASURES. *(Technische Massnahmen zur Luftreinhaltung). Text in German. In: Reinhaltung der Luft in Nordrhein Westfalen. Essen, West Germany, Brinck and Co. KG, 1969, p. 19-46.*

Mandatory pollution control improvement programs which were introduced in the state of Nordrhein-Westfalen in 1961 are described. These abatement programs were designed to reduce the emission of pollutants by the steel industry (from, for example, Thomas converters, Siemens-Martin furnaces, flaming installations and ore sintering plants), by iron foundries (including cupola ovens and induction ovens), steam power plants, cement plants, stoneware plants, and by coal processing plants including cokeries and briquette works. In recent years the state government contributed $2.8 million towards the development of improved smoke desulfurization processes and about $280,000. towards the improvement of existing dust arresters. All together five processes which were promising enough to warrant pilot plant tests were further developed: the Reinluft process (adsorption of SO2 on semicoke and its subsequent conversion to sulfuric acid); the additive process (blowing of lime or dolomite dust into the furnace to remove oxides of sulfur); the Still process (absorption of SO2 by the CaO contained in bituminous coal ash); the sulfacid process (wet catalytic conversion of SO2 to H2SO4); and the Grillo process (absorption of SO2 by a contact mass containing metal oxides which is subsequently regenerated). The last process is the most promising of the five for application on a large scale because regeneration is carried out independently and the user does not have to invest in a regeneration installation. New developments in filtering technology are the separation of dusts of high electrical resistance by means of an alternate current filter (ferrosilicon dusts), a new waste gas purification installation for the reduction of the emission of soot and of SiO2 aerosol by silicon carbide plants. The control of odors emitted by the chemical, food and other industries, maximal smoke emission norms, and norms for emissions from incinerator, oil fired furnaces, chemical cleaning plants, plants manufacturing bituminous road building materials, and lacquer drying ovens are discussed.

14143 APTIC NO. 32099

Japan Environmental Sanitary Center, Tokyo

REPORT OF THE STUDIES OF THE PREVENTION OF OFFENSIVE ODORS (NO. 3). *(Akushuboshi ni kansuru kenkyu hokokusho. (Dai III ho)). Text in Japanese. JESC-42-076. 82p., March 1968.*

Environmental pollution problems in every Japanese prefecture include offensive odors from fish meal plants, fish manure mills, and factories for drying chicken droppings. The condition of deodorizing equipment installed in such factories, methods for measuring offensive odors, and future countermeasures were surveyed. Eight models of deodorizing equipment were tested. Construction and maintenance costs of these models are tabulated along with data for currently installed equipment. Since deodorizing equipment associated with a single method does not effectively eliminate odors, deodorization by a combination of methods was postulated. Gas chromatography was adopted as the main method for measuring an offensive odor and as the method for collecting samples. Sampling amines, mercaptans, and organic acids by glass-bead tubes is also described, and results are reported for actual measurements. Based on investigations of the sources of offensive odors at 25 mills, the chief constituents of basic offensive odors are ammonium and trimethylamine. Other low-grade amines were scarcely observed. The usual rate of ammonium and trimethylamine in emission sources is between 1 to 10 and 10 to 1 in fish meal plants and one to one in the factories for drying chicken droppings. In some cases, exhaust concentrations exceeded 100 ppm. Six types of deodorizing equipment were observed, but almost no factory had a satisfactory blueprint for eliminating pollution. The economics of proposed measures are discussed.

14144 APTIC NO. 32231

AIR POLLUTION CONTROL, NATIONAL FERTILIZER DEVELOPMENT CENTER, WILSON DAM, ALABAMA. *Tenn. Ind. Hyg. News., 22(1):1-5, Winter 1965.*

In the fertilizer development center, dusts are evolved from the agitation of solid dry materials. The phosphatic dusts are relatively easy to collect, being noncorrosive and fairly heavy. Coke and coal dusts are non--corrosive but less dense. Simple dry cyclones with collecting efficiencies of 80-90% are useful as precleaners. These must be followed by a wet scrubber. At the nodulizing kilns, an electrostatic precipitator is employed for dust removal, and a scrubber is used for fluorine removal. Resolution of industrial hygiene-air pollution problems is based primarily on exhaust ventilation, modernization of air-cleaning equipment, and confinement of process materials to the process. Pollution control activities between 1950 and 1968 are described. During 1960 to 1968, a new stainless steel phosphoric acid unit was added where fluorine and phosphoric anhydride losses are reduced to a negligible amount. A phosphorus centrifuge for treating phosphorus sludge was also added. Improved oxides of nitrogen removal was accomplished with small pressure nitric acid units. Wet, dynamic scrubbers were installed. A 165 ton/day high-efficiency nitric acid unit was also added. Ammonia, dusts, fluorine, nitrogen oxides, P205, and sulfur dioxide have been reduced since the initiation of the control system.

14145 APTIC NO. 32247

SYSTEMS ANALYSIS OF EMISSIONS AND EMISSIONS CONTROL IN THE IRON FOUNDRY INDUSTRY. VOLUME II. EXHIBITS. *Kearney (A. T.) and Co., Inc., Chicago, Ill., Air Pollution Control Office Contract CPA 22-69-106, 180p., Feb. 1971.*

NTIS: PB 198349

An investigation was undertaken to define the air pollution problems of the iron foundry industry, and to set priorities for research and development work that will lead to improved emission control capabilities at reduced cost. Graphs, illustrations, and tables are presented in this volume. They pertain to iron foundry production trends, population trends, and the geographical distribution of foundries. Cupola and electric furnace trends are also indicated. Characteristics and sources of emissions are depicted for various foundry operations. Process specifications and process flow diagrams are presented. Various types of furnaces are illustrated. The Ringelmann scale and other measurement methods are included. The effect of various operating parameters on emissions are presented. Control equipment and costs are considered. Control equipment mentioned includes cyclones, collectors wet collectors, venturi scrubbers, impingers, fabric filters bag filters, afterburners, catalytic afterburners, and electrostatic precipitators.

14146 APTIC NO. 32251

SYSTEMS ANALYSIS OF EMISSIONS AND EMISSIONS CONTROL IN THE IRON FOUNDRY INDUSTRY. VOLUME I. TEXT. *Kearney (A. T.) and Co., Inc., Chicago, Ill., Air Pollution Control Office Contract CPA 22-69-106, 286p., Feb. 1971. 84 refs.*

NTIS: PB 198348

An investigation was undertaken to define the air pollution problems of the iron foundry industry, and to set priorities for research and development work that will lead to improve emission control capabilities at reduced cost. An extensive search of the literature was conducted to identify and list in a single bibliography published material pertinent to the subject of this study. Emission sources in the foundry are indicated, as well as control capability. The majority of the foundries use cupolas, with only about 15% of production using other forms of melting. Metallic oxides, silicon and calcuim oxides, and combustible materials are the major components of particulate emissions. A technical and economic analysis of control technology is presented. Trends are projected.

14147 APTIC NO. 32305

AN EVALUATION OF COAL CLEANING PROCESSES AND TECHNIQUES FOR REMOVING PYRITIC SULFUR FROM FINE COAL. (FINAL REPORT). *Bituminous Coal Research, Inc., Monroeville, Pa., Air Pollution Control Office Contract CPA 70-26, BCR Rept. L-404, 301p., April 1971.*

NTIS: PB 199484

Where it is feasible to physically remove pyrite from coal in significant quantitites, the amount of sulfur oxides produced from coal firing can be reduced. Twenty-two coals were pulverized to a topsize of 30 mesh; each grind was subjected to a float-sink separation at a 1.60 specific gravity in the centrifuge; and finally, sulfur reduction calculations were made for both total and pyritic sulfur. Nine Eastern coals were collected and subjected to two-stage cleaning studies under Phase II of the program to determine the suitability of the concentrating table for cleaning these coals at a topsize of 30 mesh. In the beneficiation studies, the raw material for testing was obtained by accumulating the heavier gravity refuse during the rough cleaning of the 3/8 inch by 0 coal on the quarter-size (No. 14) concentrating table. This heavy refuse was then pulverized to minus 30 mesh and the pyrite concentration was undertaken using a 15-S metallurgical concentrating table. To simulate the recirculation of middling product that had been further reduced in size to increase pyrite liberation, the middling material from the process was collected, pulverized to minus 60 mesh, and recleaned on the same 15-S concentrating table. Numerous high-sulfur, high-ash fractions containing significant quantities of combustible material were collected during the three concentrating table tests and analyzed.

14148 APTIC NO. 32480

MINERAL INDUSTRY VS. ECOLOGY--A BALANCE BETWEEN DEVELOPMENT AND ENVIRONMENTAL QUALITY. *Mining Engineering, 23(8):51-60, Aug. 1971. 28 refs.*

Pneumoconiosis is considered the most severe health problem faced by the coal industry. The Federal Coal Mine Health and Safety Act of 1969 provides for the elimination of this occupational health hazard by limiting dust levels in mines to two mg/cu m by December 30, 1972. To achieve this goal, coal producers try to prevent dust from forming, and if it does form they either suppress the dust at the face or remove airborne dust along the air stream by various means. Currently, spray equipment, mist projectors, ventilating equipment, filtering devices, dust collectors, water infusion systems, and improved cutting tools help to control airborne dust. Cryogenic respirators are also of value, as well as superoxide chemicals and chlorate candles for producing oxygen. A list of approved respirator equipment and their makers is presented. The incidence of silicosis is discussed. Ventilation for underground operations is considered, as well as the control of radiation from nuclear plants. Spoil banks, high walls, toxic soil, and waste disposal are the basic ways in which surface mining disturbs the land. Stabilization of tailing ponds is discussed. Open-pit mining is considered, and the problem of waste water treatment is discussed. Limestone injection, a catalytic oxidation fused salt process, and shale oil production are considered for the control of sulfur oxides.

14149 APTIC NO. 32482

PROGRESS WITH WASTE GAS DESULFURIZATION. *(Fortschritte bei der Abgasentschwefelung). Text in German. Umwelt (Duesseldorf), 1(4):48-49, 1971.*

Without control measures, the present emission of sulfur dioxide in West Germany (1.5 million t/yr) will triple by the year 2000. A new desulfurization process, which can be used to clean the waste gases of oil and coal-fired power plants, sulfuric acid factories, and refineries is examined. The waste gas was passed through a specially developed activated coke layer, and the SO2 was converted to sulfur trioxide. In the presence of water vapor this was further converted to H2SO4. Regeneration of the loaded coke through scrubbing yielded a 15 to 20% H2SO4; thermal regeneration yielded a gas containing 30-40% SO2. The operating costs could be reduced through sale of the recovery end products; the investment costs for the process are acceptable.

14150 APTIC NO. 32503

WASTE GAS CLEANER FOR DIESEL ENGINES. *(Abgasreiniger fuer Dieselmotoren). Text in German. Wasser Luft Betrieb, 15(9):353, Sept. 1971.*

An exhaust gas cleaner which comprises a honeycomb catalytic arrangement is described for burning the aliphatic aldehydes from diesel engines and converting them into water and carbon dioxide. The honeycomb catalysts are unbreakable and can easily be replaced. The degree of decontamination of the exhaust gases depends to a large extent on the temperature of the gases. The afterburner was tested with a 46 HP diesel engine on a dynamometer. At an exhaust gas temperature of 380 C and with a three-quarter load, the carbon monoxide emissions without an afterburner were 450 ppm, with the afterburner they were 10 ppm. Hydrocarbon emissions were reduced from 510 mg/cu m to 185 mg/cu m, and soot was reduced from 39 mg/cu m to 22 mg/cu m.

14151 APTIC NO. 32506

NEWS FROM INDUSTRY AND TECHNOLOGY. *(Aus Industrie und Technik). Text in German. Wasser Luft Betrieb, 15(9):345-352, Sept. 1971.*

New equipment for dust and pollutant removal, was displayed at the Pro Aqua-Pro Vita fair (Germany). A filter for hot gases operates at a temperature of 950 C with no waste gas cooling required. It is made of ceramic materials. A reverse air jet envelope-type cloth filter was shown for cleaning gas with a maximum temperature of 220 C. The filter is portable and can be used in treatment plants for highway construction materials. The envelopes are arranged in two rows, with one after another cleaned by intermittent impacts of compressed air. A new wet collector has been developed for the collection of very fine dusts and mists. It is called a centrifugal agglomerator.

14152

APTIC NO. 32355

Agnew, William G.

AUTOMOTIVE EMISSION CONTROL. *Preprint, General Motors Corp., Detroit, Mich., p. 5-13, 1971. (Presented at the Conference on Progress in Areas of Public Concern, Milford, Mich., Feb. 1971.)*

Air pollution due to automotive emissions is examined. Automotive contribution to air pollution, with respect to emission levels of hydrocarbons, carbon monoxide, nitrogen oxides, sulfur oxides, and particulate matter amounted to 39% of the total for 1968. This figure was correlated to particular effects of the pollutants on human health and plant life. When both total tonnage and these health concern issues were considered, transportation was responsible for less than 10% of the total U. S. air pollution problem for 1968. Automotive emission controls are examined, including crankcase controls, evaporative controls, lower compression ratios, and engine design modifications which allow cars to operate on lower octane, low-leaded or unleaded gasoline. Major reductions were made in hydrocarbon and CO emissions. Future research projects on emission control include the development of improved carburetion, electronic fuel injection, a catalytic converter, and alternatives to the spark-ignition engine.

14153

APTIC NO. 31939

Aitkenhead, Paul, Robert Ruhlman, and Lewis G. McClintock

ELECTRONIC AIR CLEANING CELL. *(Emerson Electric Co., Electro-Air Div.) U. S. Pat. 3,581,470. 15p., June 1, 1971. (Appl. Dec. 30, 1969, 18 claims).*

Collecting cells in electronic air cleaners usually consist of a series of spaced electrodes, an alternate series of positive ionizing wires, and an alternate series of positively and negatively charged collecting plates which attract ionized dirt particles carried by forced air flow. The cells are expensive to construct and not always uniform in their production. These disadvantages are overcome in an electronic air cleaner consisting of alternate groups of parallel collecting plates of different polarity. Each group of plates has spaced aligned holes and cleaner holes. Metal tubes expanded and locked in the aligned holes of one group of plates pass through the clearance holes of the group of plates pass through the clearance holes of the group of plates of differing polarity. The tubes maintain the alternate groups of collecting plates in position equally spaced, parallel to each other. The metal tubes are preferably expanded to a nonround shape such as rifled or polysided to enhance engagement with the plates. The preferred end panel is conductive with spaced cutouts having overlying insulating plates with at least one tube aligning hole. The plate is loosely attached to the end panel to permit alignment of the holes with selected conductor tubes. Depressions are also provided in the panel for other selected tubes to permit engagement of tube ends with the end panels in the same plane.

14154

APTIC NO. 32090

Akagi, Mitsuru and Minoru Tsukahara

STUDIES OF ENGINE EXHAUST GAS ON AIR POLLUTION, IV. THE WALL TEMPERATURE IN COMBUSTION CHAMBER AFFECTING EXHAUST GAS COMPOSITION. *(Taiki osengen busshitsu to shiteno kikan haiki no kenkyu, IV. Haiki gasu sosei ni oyobosu nenshoshitsu hekion no eikyo). Text in Japanese. Muroran Kogyo Daigaku Kenkyu Hokoku (Mem. Muroran Inst. Technol., Sci. Eng.), 7(1):229-238, July 1971. 8 refs.*

The flame-quenching effects of combustion chamber wall temperature on engine exhaust gas were studied. The stainless steel combustion chamber used for the experiment was 106 cc in capacity and had an inner wall surface area of 142 sq cm. The experiment was conducted with a commerical liquefied petroleum gas, at five different air-fuel ratios, and at six different wall temperatures. Pressure of the gas mixture was constant at two kg/sq cm. Exhaust gas was sampled by the water substitution method, then sealed in the measuring tube of a gas chromatograph by the reverse substitution method. Hydrocarbons were detcted by a flame ionization detector and carbon monoxide by a TCD (?). When exhaust gas produced by one combustion cycle was sampled at several different times, the later samples have a higher the hydrocarbon density. Therefore, the whole volume of combustion gas was extracted at one time in this experiment. Both hydrocarbons and CO decreased at air-fuel ratios somewhat lower than the theoretical ratio. Carbon monoxide was practically unaffected by wall temperature. Hydrocarbons increased with lower air-fuel ratios and lower wall temperatures, the increase involving substances produced as a result of decomposition. Since the decomposed substances resulted from imperfect combustion taking place in other than the flame-quenching zone, the effect of wall temperature was rather indirect. Practically no combustion reaction took place in the flame-quenching zone near the wall from which unburned substances were discharged.

14155

APTIC NO. 32402

Alanova, T. G.

PURIFICATION OF AIR FROM ORGANIC IMPURITIES BY CATALYTIC COMBUSTION. *(Ochistka vozdukha ot organicheskikh zagryazneniy kataliticheskim dozhiganiem). Text in Russian. Zh. Vses. Khim. Obshchestva im D. I. Mendeleeva, 14(4):381-388, 1969. 107 refs.*

The catalysts recommended for the oxidation of organic compounds in industrial gases to carbon dioxide and water are metals, semiconductors (pure and mixed oxides of metals, spinels), and salts. Data are used to discuss individual catalysts in terms of their ability to catalyze the oxidation of all organic components of gases, their working temperature range, suitable catalyst carriers, their effect on catalytic activity, catalytic stability with heat and contact poisons, and their availability and price. In industry; the platinum compounds have been most often used in the active form on metal or ceramic carriers and as active oxides on oxide carriers (like silicon dioxide). The basic design of an industrial apparatus for catalytic combustion is given and its modifications are discussed depending on specific production situations, that is, the quantity and temperature of gases, and the composition and concentration of oxidized components. Catalytic oxidation is recommended for the purification of toxic and odorous gases, and of gases with high organic compound concentrations, if their recovery is difficult and the gas needs recycling. On the other hand, it is not economical to burn large volumes of gases of low heat capacities. The heat exchanger is the main investment, while production costs are mainly in fuel for gas preheating.

14156

APTIC NO. 32166

Anderson, Catherine E. and Horst R. Adolf

ODOR CONTROL IN THE RENDERING AND FOOD PROCESSING INDUSTRIES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1971. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-22.)*

The effectiveness of potassium permanganate used in the solution of an air scrubber to control the odors related to the rendering and food processing industries was investigated. These odors are caused by the presence of aldehydes, ketones, organic acids, alcohols, organic nitrogen compounds, and organic sulfur compounds. Laboratory scale experiments were performed using a gas washing bottle on these compounds. The effectiveness of odor removal was measured by the syringe technique and by gas chromatographic methods. Odor reduction ranging from 80 to 98% was achieved. Experiments on simulated samples using a 500 cfm Virotrol air scrubber verified the laboratory results. An increase in efficiency of odor removal can be accomplished by increasing the pH of the scrubbing solution. In scrubbers which have a recirculating solution, maintenance of pH at levels higher than nine requires constant adjustment. However, the use of scrubbers in which the solution only passes through once provides a simple way to scrub at any desired pH level. (Author abstract modified)

14157 APTIC NO. 32321

Andreuzzi, Frank C.

A METHOD FOR EXTINGUISHING AND REMOVING BURNING COAL REFUSE BANKS. *Bureau of Mines, Information Circ., No. 8485, 29p., 1970. 5 refs.*

A solid waste demonstration project was conducted on a burning coal refuse bank to develop and evaluate an efficient method of extinguishing burning coal refuse and moving it. Such banks are a significant source of smoke and fumes. A series of tests were performed using water monitors and related apparatus to quench the burning material and, at the same time, using earth-moving equipment to transport, spread, and compact the extinguished material. The most effective method consisted of water-quenching the surface material to a workable depth, ripping, and removing the quenched material with a bulldozer and tractor-scraper. The total cost was estimated to be $0.44/cu yd. (Author abstract modified)

14158 APTIC NO. 32384

Arkhipova, L. N., V. M. Ramm, and I. M. Maltseva

METHODS OF PURIFICATION AND FURTHER PROCESSING OF FLUORINE CONTAINING GASES IN THE PRODUCTION OF PHOSPHATE FERTILIZERS. *(Metody ochistki i pererabotki ftorcoderzhashchikh gazov ot proizvodstv fosfornykh udobreniy). Text in Russian. Zh. Vses. Khim. Obshchestva im. D. I. Mendeleeva, vol. 14:415-420, 1969. 70 refs.*

The choice of the gas purification method for fluorine-containing stack gases produced during phosphate fertilizer production depends on the character of the purified gases (the fluorine and dust content). In gases free of dust, silicon tetrafluoride can be recovered by absorption in water or ammonia solution. Dust containing gases have to be dedusted in cyclones and then SiF_4 can be obtained by absorption in sulfuric acid. Gases of low fluorine content containing dust can be purified directly by wet methods. Some industrial designs of the above methods are discussed. Further processing of absorbed fluorine leads, according to the method used, to one of the following products: sodium fluorosilicate, sodium fluoride, aluminium fluoride, sodium aluminium fluoride, potassium fluoride, hydrogen fluoride. If both technologic and economic aspects of the problem are considered, only a limited number of the above methods is suitable for practical realization.

14159 APTIC NO. 32227

Bagwell, F. A., K. E. Rosenthal, D. P. Teixeira, B. P. Breen, N. Bayard de Volo, and S. Kahro

UTILITY BOILER OPERATING MODES FOR REDUCED NITRIC OXIDE EMISSIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 37p., 1971. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27- July 2, 1971, Paper 71-11.)*

The results of a continuing program to reduce nitric oxide emissions from gas and oil fired utility boilers are discussed, together with the formation of NO and the controlling factors. Two approaches have been developed for reducing NO emissions: off-stoichiometric combustion and reducing combustion temperatures. Off-stoichiometric combustion involves operating burners at fuel-rich mixture ratios. The proportion of fuel combusted at peak temperatures is reduced; thus, NO emissions are lowered. The remaining air required to maintain the overall stoichiometry is introduced to complete combustion within the bulk gas. The second approach, reducing the combustion temperatures, can be accomplished by several different techniques. One involves recirculating product gases and mixing them with the combustion air. The product gases act as inert, absorbing a fraction of the energy released in combustion, and thereby, reduce the peak temperatures. A second technique is to reduce the combustion air preheat. Results of field testing using these techniques are demonstrated. Boiler operating characteristics affecting NO and the implementation of the techniques for achieving operation reduction in NO emissions are discussed.

14160 APTIC NO. 31929

Bailleul, M. R., P. Berthier, and G. Guyot

POLLUTION AND SULFUR PLANTS. *Natural Gas Processors Assoc., Tulsa, Okla., Proc. Nat. Gas Process. Assoc., Ann. Conv., Denver, Colo., 1970, p. 89-92. (March 17-19.)*

The quantities and concentration of sulfur dioxide released by a Claus reaction sulfur plant are discussed. Regulations pertaining to the maximum permissable SO_2 concentration at ground level are cited. There are two different possible approaches to the problem: treat the stack gases as they are, which means removing the SO_2 and eventually making a saleable product at the same time; or try to improve the yield of the transformation reaction, by improving the Claus unit itself. External processes have included scrubbing the stack gases with ammonia, fixed bed catalysis with ferric oxide, and a wet process which first incinerates the gases and then passes them through a converter containing a vanadium oxide-based catalyst. Methods to maintain optimum conditions which are in operation at the Societe Nationale des Petroles d Aquitaine (France) are listed.

14161 APTIC NO. 31978

Ballennie, Peter, Eileen Margaret Ballennie, and Angelo P. Ruffo

COMBINATION AIR FILTER AND FRAME FOR HOLDING THE SAME. *(Industrial Air Filters Ltd., Montreal (Quebec)) U. S. Pat. 3,577,712. 3p., May 4, 1971. 6 refs. (Appl. May 28, 1969, 1 claim).*

A frame is described consisting of plural frame members in a rectangular configuration for a removable mounted air filter media. Each frame member has a base and a resilient wall in a spaced apart relationship. A rigid finger extends downward from the rigid wall towards the resilient wall so that the air filter media is gripped between the finger wall and the resilient wall. The frame member has a flange as an extension of the base protion. The connectors presently in use do not provide any convenient means for fastening the connector to the support means. They are also difficult to join at corners. (Author abstract modified)

14162 APTIC NO. 32414

Barrett, R. E. and D. W. Locklin

INDUSTRIAL STEAM GENERATION AND COMMERCIAL AND RESIDENTIAL HEATING. *In: The Federal R and D Plan for Air-Pollution Control by Combustion-Process Modification. Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., 1971, APCO Contract CPA 22-69-147, Rept. APTD-0643, p. V-1 to V-47, Jan. 11, 1971. 48 refs.*

NTIS: PB 198066

Energy-conversion devices within the source category of industrial steam generation and commercial and residential heating are used primarily for converting chemical energy in fuel to thermal energy in the form of steam, hot water, or warm air. Possibilities for pollutant emission reduction by combustion modification are discussed as they pertain to steam generation, space heating, and service water heating. Principal fuels utilized for these applications include: bituminous coal, small quantities of anthracite coal and lignite, residual fuel oil, distillate fuel oil, propane and butane, and natural gas. Pollutant emission levels are mentioned for products of incomplete combustion, nitrogen oxides, sulfur oxides, fly ash, and other noncombustible particles. The empirical knowledge relating combustion variables to emissions is cited, as well as combustion equipment development, techniques for lowering peak gas temperatures, flue-gas recirculation, and other techniques for achieving low-temperature combustion. Servicing and maintenance, additives and emulsions, and fluidized-bed combustion are discussed. Current and relevant combustion research and development are summarized.

14163 APTIC NO. 32458

Benner, Don W.

HIGH EFFICIENCY REMOVAL OF OIL AEROSOLS FROM COMPRESSED AIR. *Paper Trade J., 155(36):49-50, Sept. 6, 1971. 1 ref.*

The best method yet found for removing the oil (hydrocarbons) and water contaminants from compressed air is a combination of direct impaction, inertial compaction, diffusion (Brownian motion), and coalescence. The first three actually enhance the latter one, the coalescing of the liquid particulates being the main method of removing them. Baffles, centrifugal flow, and flow directional changes of the air stream are helpful in causing coalescence and impingement. Passing air through porous media also is effective. The best way to coalesce liquid particulates from compressed air is to control the air flow and velocity as it passes through a fibrous bed of predetermined porosity which has minute strands and permanent electrostatic charges. A material such as borosilicate glass strands with a mean diameter of 0.5 micron fulfills the need for a non-wettable, austinetic and non-toxic material. Air velocity and filter design are also considered.

14164 APTIC NO. 31866

Borgwardt, Robert H. and Richard D. Harvey

PHYSICAL PROPERTIES OF CARBONATE ROCKS RELATED TO SO2 REACTIVITY. *Air Pollution Control Office, Cincinnati, Ohio, Process Research Section and Illinois State Geological Survey, Urbana, 41p., 1971. 16 refs.*

Petrographic examination and grain size-distribution measurements were made on 11 specimens representing a broad spectrum of limystones and dolomites. The sulfur dioxide reaction kinetics of calcines prepared from each rock type were determined at 980 C. Stones of various geological types yield calcines of distinctly different physical structures that show correspondingly large differences in both rate of reaction and capacity for SO2 sorption. Pore size and particle size together determine the extent to which the interior of individual particles react. Particles smaller than 0.01 cm with pores larger than 0.1 micron react throughout their internal pore structure at a rate directly proportional to the B.E.T. surface. The rate decays exponentially as sulfation proceeds until the pores are filled with reaction product. The ultimate capacity of small particles is determined by the pore volume available for product accumulation, which is generally equivalent to about 50% conversion of the calcium oxide in limestones. Variations in effectiveness of carbonate rocks for flue gas desulfurization are explained by the physical properties of their calcines, which are related to the crystal structure of the original rock. The high reaction rates achieved in the limestone injection process apparently result from the large surface areas existing for short periods immediately following the dissociation of CaCO3. (Author abstract)

14165 APTIC NO. 31964

Braun, Werner and Dieter, Jobsky

ECONOMIC ENVIRONMENTAL PROTECTION THROUGH REMOTE HEAT SUPPLY (PART 1). *(Wirtschaftlicher Umweltschutz durch Querverbund (Teil 1). Text in German. Energie Tech., 23(7):229-233, July 1971.*

Improvement of air quality necessitates combatting air pollution locally at the points of origin. Industrial processes affect the organic and inorganic nature of the environment, and leave residues in the form of waste gases and waste heat. One approach to the reduction of these waste products is to attempt to emit them into higher atmospheric strata for better dilution or to utilize cleaning methods to remove the worse pollutants. Another approach is to attempt to diminish the number of sources of air pollution, for example by replacing coal-fire domestic heaters with remote heat supplies. Mathematical models are an essential tool in studies of complex pollution processes.

14166 APTIC NO. 32493

Bricard, J., G. J. Madelaine, and R. Wajsfelner

ELECTRICAL BEHAVIOR OF SUBMICRONIC AEROSOLS. *(Comportement electrique des aerosols submicroniques). Text in French. J. Aerosol Sci., 2(2):165-173, June 1971. 11 refs.*

The electrical behavior of polystyrene latex aerosol particles was studied with an electrostatic precipitator. The effect of varying electrical charges carried by the particles on the conductivity of the suspension was studied to determine the calibration of the precipitator. Experimentally determined curves, representing variations of the charge distribution as a function of the conductivity of the suspension for particle diameters of 0.357, 0.714, and 1.9 micron were decreasing functions of conductivity. Curves were also drawn for the electrical charge as a function of the diameter of the atomizer capillaries, of the pressure of compressed air, and of conductivity. Results revealed that charge distribution for a given conductivity is primarily the result of the variation of the diameter of atomized droplets. Experiments designed to study the aerodynamic diameter of agglomerates of spherical particles of polystyrene latex disclosed that resistance to the movement of the particles was independent of the form of the agglomerate and depended solely on the number of agglomerated particles. The aerodynamic diameter of agglomerates varies with the cube root of the number of agglomerated particles.

14167 APTIC NO. 32237

Bridgstock, Guy and Rauno Seeste

ENVIRONMENTAL CONTROL THROUGH THE USE OF FLASH SMELTING. *Preprint, American Inst. of Chemical Engineers, New York, 6p., 1970. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 63rd, Chicago, Ill., Dec. 1970.)*

The problem of atmospheric pollution caused by sulfur dioxide in furnace gases resulting from the smelting of sulfide copper ores and concentrates is reviewed. A recently developed flash smelting process reduces the SO2 effluent by increasing the SO2 content of the process off-gases to enable the significant recovery of sulfuric acid or sulfur. Flash smelting, which combines in one operation the roasting and smelting methods for treating sulfide copper concentrates, consists of mixing finely dried concentrates with preheated air at the top of the reaction shaft of the flash furnace in a specially designed concentrate burner. The smelting, concentrate preparation, formation of matte and slag disposition, gas and dust control, matte tapping, converting, fuel economics, and high SO2 content of the gas stream are individually treated. The gas, treated in contact acid plants, produces sulfuric acid and reduces atmospheric pollution from SO2 to a negligible level. A comparison of the reverbatory smelting and flash smelting processes indicates that although initial installation costs of the flash smelting process are higher, they are offset by the lower operating costs and higher metal recovery.

14168 **APTIC NO. 32390**

Brokaw, Richard S. and David A. Bittker

CARBON MONOXIDE OXIDATION RATES COMPUTED FOR AUTOMOBILE EXHAUST MANIFOLD REACTOR CONDITIONS. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA TN-D-7024, LRC Rept. E-6035, Work Unit 129-01, 19p., Dec. 1970. 23 refs.*

NTIS: NASA TN D-7024

The thermal reactor is a candidate system for reducing the carbon monoxide and hydrocarbon content of automobile engine exhausts. In this scheme, the exhaust manifold is replaced by a large, well-insulated volume. Secondary air is injected at the cylinder exhaust ports and reacts with the pollutants in this thermal reactor. Conditions which are conducive to rapid carbon monoxide and hydrogen oxidation -- namely large concentrations of hydrogen atoms, oxygen atoms, and hydroxyl radicals -- will also bring about rapid oxidation of the hydrocarbons. Thus, the residence times that are estimated for the cleanup of carbon monoxide should also apply for the cleanup of hydrocarbons in exhaust manifold reactors. By integrating differential equations for a system of 29 reversible chemical reactions, carbon monoxide oxidation rates have been computed. At temperatures above about 1030 K, oxidation is rapid and is complete in times short in comparison to the residence times in exhaust manifold reactors. This suggests that such reactors are mixing rate limited, not reaction rate limited. Rates may be considerably slower at temperatures below 1030 K. At these lower temperatures, the reaction is catalyzed by nitric oxide. Thus, elimination of nitric oxide from automotive exhausts might degrade the low temperature performance of exhaust manifold reactors. (Author summary modified)

14169 **APTIC NO. 31967**

Buerkholz, A.

DROP SEPARATION FROM WIRE MESH FILTERS. *(Tropfenabscheidung an Drahtfiltern). Text in German. Chem.-Ing.- Tech., 43(21):1314-1321, Nov. 1970. 13 refs.*

A criterium of the effectiveness of drop separators employed in chemical plants to separate droplets from waste air is the separation degree which largely depends on droplet size. The chemical industry uses wire mesh separators to separate droplets with diameters between 0.5 and 20 micron. They consist of superimposed layers of 0.25 mm wire mesh with two mm distances between individual layers. Thus, a compact horizontal wire mesh sieve of high porosity is obtained which is inserted into the duct through which the droplet-laden waste air passes in an upward direction. The droplets are retained by the wire mesh as a film which coalesces into drops that fall off. Such devices are used primarily in sulfuric acid plants to remove sulfuric acid droplets suspended in waste air which would otherwise cause corrosion and dangerous pollution. An analysis of fractional separation curves obtained experimentally by using a cascade impactor, revealed that in all filters, including those made of wire mesh, fibers, or a bed of filling material, the degree of separation increased with increasing flow velocity of the waste air. Fractional separation degrees, calculated from impact separation by single fibers, were in good agreement with experimentally determined values.

14170 **APTIC NO. 31995**

Burton, James S.

APPLICATION OF INFRARED SPECTROSCOPY TO THE STUDY OF GAS-SOLID INTERACTIONS BETWEEN SO2 IN A SIMULATED FLUE GAS AND VARIOUS SOLID ADSORBENTS. *Preprint, 21p., 1970. 11 refs. (Presented at the Mid-America Symposium on Spectroscopy, 21st Annual, Chicago, Ill., June 2-5, 1970.)*

The infrared study of gas-solid interactions to aid in the design of control processes for the removal of sulfur dioxide from stack gases in power plants is reviewed. The mechanism of dead burning and the measurements of the thermodynamics of the gas-solid interaction mechanism, and the reaction rates are studied using infrared spectroscopy. The dead burning of limestone was defined as the condition where the surface of the limestone adsorbent is deactivated with respect to the further adsorption of gaseous SO2. The mechanism of dead burning was investigated by determining whether it is possible to regenerate the limestone adsorbent and restore the ability of the limestone to readsorb SO2. The thermodynamics of the process was measured by determining the rate of reaction as a function of temperature. The reaction mechanism was determined by detecting the formation of chemical species like sulfate on the surface and differentiating between chemical and physical adsorption. The reaction rates were determined by measuring the growth of an infrared band attributed to adsorbed SO2 as a function of time. The amount adsorbed was measured in terms of sulfate formed.

14171 **APTIC NO. 31790**

Buxton, Winslow H., Jr.

PROCESS AND APPARATUS FOR PULP MILL CHEMICAL RECOVERY AND ODOR ABATEMENT. *(Western Kraft Corp., Albany, Oreg.) U. S. Pat. 3,574,556. 6p., April 13, 1971. 13 refs. (Appl. March 4, 1969, 8 claims).*

A process and apparatus are presented for the recovery of chemicals and the abatement of odors emitted by the recovery furnace of kraft pulp mills. Gases from the discharge stack of the recovery furnace are diverted to an afterscrubber in which they are sprayed with an alkaline weak wash liquor resulting from the washing of calcium carbonate mud and solid dregs produced by causticizing the green liquor. Thus, hydrogen sulfide, mercaptans, and other malodorous gaseous compounds are removed. Corrosion is minimized, heat is recovered, and a problem of waste disposal in the mill effluent streams is avoided. (Author abstract modified)

14172 **APTIC NO. 31976**

Cicirello, Daniel J.

ENVIRONMENTAL AIR SANITIZER. *(Assignee not given.) U. S. Pat. 3,576,593. 5p., April 27, 1971. 9 refs. (Appl. April 28, 1969, 9 claims).*

An important, but seldom mentioned, consideration concerning any air treatment apparatus which uses a chemical or vapor phase additive treatment superimposed upon an ultraviolet radiation treatment is the ability to adjust the intensity of the respective treatments and thus, to conform the treatment to the requirements as they may vary from time to time. An apparatus for selectively treating environmental air is described. It includes facilities for withdrawing the air from a room through a mechanical filter and dividing the air into two discrete paths. One path is chemically treated by adding a vapor phase additive, while the other path is treated with germicidal ultraviolet radiation followed by ozonizing ultraviolet radiation.

14173 **APTIC NO. 32302**

Clayton, P.

BRICKWORKS ODOURS. A LABORATORY INVESTIGATION OF THEIR PRODUCTION, EVALUATION AND REMOVAL. *Ministry of Technology, Stevenage (England), Warren Spring Lab., Rept. LR122(AP), 10p., 1970. 8 refs.*

An odor similar to that experienced near brickworks was produced by heating clay at a temperature between 440 and 500 C and diluting the products evolved. The combustion of organic material evolved was monitored with a flame ionization detector; the odor was reduced when the organic matter was removed. The extent of the reduction in odor and decrease in organic content depended upon the residence time of the gases at the temperature of the hot zone and the flow rate of secondary air through the hot zone of the second furnace. (Author abstract modified)

14174 APTIC NO. 32059

Cole, Charles Snowden, Jr.

THE UTILIZATION OF SULFUR DIOXIDE. CATALYTIC ACTION WITH NATURAL GAS. *Illinois Univ., Urbana, Dept. of Chemistry, Thesis (M.S.), 1941, 71p. 49 refs.*

Because sulfur dioxide can now be recovered from waste gases, new uses for SO2 are needed. Historical and theoretical work on the reduction of SO2 is presented. The catalytic reduction of sulfur dioxide with natural gas was studied on a small scale to determine the behavior of the reaction under varying operating conditions. The gas-phase reduction of SO2 with natural gas was carried out with a calcium sulfate catalyst. Fifteen runs were made at four temperatures, three space velocities, and five ratios of SO2 to methane. Also, thermodynamic data were plotted for a number of reactions related to the reduction of SO2. The simultaneous determination of the reaction products was carried out in a scrubbing tower (for sulfur determination), an iodine bubbler (SO2 and hydrogen sulfide), an absorption bubbler with calcium chloride and ammonium hydroxide (carbonyl sulfide and carbon dioxide), an absorption bubbler with potassium ethyl xanthate (carbon disulfide), and an Orsat apparatus (oxygen, carbon monoxide, hydrogen, methane, ethane, and nitrogen). Two reaction mechanisms were suggested: the first predominates at low ratios of SO2:CH4, where H2S is principally obtained; the second holds at higher ratios, where mainly free sulfur is formed. By varying the temperature, space velocity, and the SO2:CH4 ratio, the reaction can be controlled to yield a product containing appreciable amounts of H2S, CS2, and free sulfur.

14175 APTIC NO. 31793

Cooperman, Philip

NOTE ON A FACTOR AFFECTING THE EFFICIENCY OF ELECTROSTATIC PRECIPITATORS. *J. Air Pollution Control Assoc., 20(12):828, Dec. 1970. 1 ref.*

The design and testing of electrostatic precipitators is based on the Deutsch efficiency formula. The theory of this formula involves a parameter which represents the velocity imparted to a particle by the electrostatic forces, but in actual practice this parameter is replaced by a parameter whose values are obtained by application of the Deutsch formula to measured values of the efficiency. For industrial scale precipitators, this new parameter is smaller than the theoretical parameter by a factor lying usually in the range two to 10. Since errors in measurement cannot account for a divergence of this magnitude, there must be at least one physical phenomenon which the theory has overlooked. The new factor is the turbulent diffusion of particles within a precipitator from regions of high particle concentration to regions of low concentration. A new formula that results from the consideration of turbulent diffusion is presented.

14176 APTIC NO. 32490

Cowen, P. S.

CUPOLA COLLECTION SYSTEMS. *Preprint, American Foundrymen s Society, Des Plaines, Ill., 7p., 1970. (Presented at the Total Environmental Control Conference, Ann Arbor, Mich., Nov. 17-19, 1970.)*

The principal items of concern in designing a cupola collection system, aside from the legal requirements, are the size of particulate matter that is to be collected, total carrier gas flow, gas composition, and temperature. Gas parameters often require alteration which can mean operating changes in cupola practice. Alterations of the charging method to restrict the charge door opening prevents puffing out of gases. Secondary combustion, cupola caps, ductwork, gas cooling, pumps, dust collectors, settling devices, exhaust blowers, and stacks or vents are discussed. Afterburners assist in oxidizing the combustible portion of the particulate matter, in converting carbon monoxide to carbon dioxide, and in maintaining certain minimum gas temperature levels. Three methods of hot gas cooling can be employed: the use of water, radiation convection by a heat exchanger, and dilution by adding tempering air. Ductwork for cupola systems is designed primarily on a basis of gas velocity, friction losses, and corrosion. Wet scrubbers, fabric filters, multiple cyclones, and electrostatic precipitators are mentioned.

14177 APTIC NO. 32469

Culhane, F. R.

DUST COLLECTORS FOR EFFLUENT CONTROL. *Preprint, American Foundrymen s Society, Des Plaines, Ill., 6p., 1970. (Presented at the Total Environmental Control Conference, Ann Arbor, Mich., Nov. 16-19, 1970.)*

A review is presented of the various types of dry collectors, their theory, principles of operation, typical applications within the foundry, and test data on their effectiveness. When determining the efficiency required or desired, consideration should be given to the distribution of the particle sizes. On of the most widely used dust collectors in industry is the cyclone which is one form of centrifugal collector. Its wide use is due to its simplicity, ruggedness, and low operating and maintenance costs. However, it is limited in its performance in the low and sub-micron range. The operating principle of mechanical collectors, which are a more refined form of centrifugal collectors, is the separation of solids from a gas stream through the optimum use of centrifugal and gravitational forces, aerodynamically applied to minimize dynamic and friction losses. An adequately sized electrostatic precipitator coupled with a properly sized, designed, and controlled conditioning tower will successfully clean foundry melting effluents to the desired residual dust level. Gas cleaning by fabric filtration represents one of the best means of obtaining the highest consistent recovery of gas-borne solid particulate matter. Cupola emissions, cinder removal, flow rates, electrical resistivity of particles, baghouse filters, and fans are also mentioned.

14178 APTIC NO. 32317

Dibelius, N. R., M. B. Hilt, and R. H. Johnson

REDUCTION OF NITROGEN OXIDES FROM GAS TURBINES BY STEAM INJECTION. *Preprint, American Society of Mechanical Engineers, New York, 4p., 1971. 4 refs. (Presented at the American Society of Mechanical Engineers Gas Turbine Conference and Products Show, Houston, Tex., March 28 - April 1, 1971, Paper 71-GT-58.)*

Tests were conducted to determine the effects of steam injection on the production of nitric oxide in gas turbine combustors. When the steam injected into the compressor discharge was 2% of the total air flow, the nitrogen oxides were reduced to 50% of what they were with no steam injection for a given load in a gas fired machine. When the steam flow was increased to 4%, the nitrogen oxides dropped to 25% of the value with no steam. (Author abstract modified)

14179 APTIC NO. 32309

Downs, W. and A. J. Kubasco

ADDENDUM TO: MAGNESIA BASE WET SCRUBBING OF PULVERIZED COAL GENERATED FLUE GAS -- PILOT DEMONSTRATION. *Babcock and Wilcox Co., Alliance, Ohio, Research Center, National Air Pollution Control Administration Contract CPA-22-69-162, Order 4152-01, BWRC Rept. 5153, 600p., Dec. 15, 1970.*

NTIS: PB 198075

A project was undertaken to demonstrate the adequacy of magnesia base wet scrubbing to remove essentially all of the particulates and most of the sulfur dioxide from pulverized coal fired furnaces. Side effects such as sulfate formation, oxides of nitrogen absorption, and scrubber operability were to be determined. The computer program, all the computer printout, and a complete record of the data obtained in this investigation are presented. The program written in Fortran IV for an IBM 360 digital computer catalogues all the input data and performs all the necessary computations.

14180 APTIC NO. 32126

Dronevich, Yu., M.

EQUIPMENT FOR PURIFICATION OF GASES IN CHEMICAL AND RELATED INDUSTRIES. *(Oborudovaniye dlya ochistki gazov v khimicheskoy i smezhnykh otraslyakh promyshlennosti). Text in Russian. Zh. Vses. Khim. Obschestva im. D. I. Mendeleeva, vol. 14:437-445, 1969. 13 refs.*

Gas purification methods in chemical and related industries are discussed, specifically purification by inertial and centrifugal separators, fiber filters, electrofilters, scrubbers, and absorbers. Factors effecting separation are taken into account. The scope and limitations of individual methods are considered, as well as the economic aspects of their operation. The design of various apparatuses, prospects of further development, and possibilities of constructional improvement are outlined.

14181 APTIC NO. 32170

Duteil, J.

UTILIZATION OF SPECIALIZED FILTER HOUSING INCORPORATING BAG-OUT FEATURES FOR RADIOACTIVE CONTAMINATION CONTROL. *American Nuclear Soc., Proc. Conf. Remote Systems Technol., 12th, 1964, p. 377-380. (Nov.)*

Although many nuclear energy plants employ high efficiency filtration systems, the filter element replacement techniques used are generally unsatisfactory for highly contaminated systems. A specially designed housing is described that permits the removal of contaminated filter elements into polyvinyl chloride bags without breaking an integral air seal during replacement operations. The housing is fabricated from mild sheet steel and contains three basic sections: an upper plenum to receive incoming contaminated air; a central zone containing the filter elements and the mechanical devices used to form the airtight seal between the element and casing; and a lower plenum that connects the filtration units to the exhaust ducting. It is necessary only to unclamp cams to release the filter unit and allow it to slide out o the housing into the attached vinyl bag. A new filter is slipped into place and locked into position by use of a cam-driven pressure plate.

14182 APTIC NO. 32190

Faith, W. L.

GASES. *In: Air Pollution Control. New York, John Wiley, 1959, Chapt. 5, p. 142-178. 84 refs.*

Gaseous contaminants in the atmosphere arise from two general sources: combustion of fuels and the handling and processing of chemicals. The latter category includes not only chemical manufacture but related activities, such as petroleum refining, smelting of ores, and various solvent-handling activities. Almost every gaseous material known escapes to the air at one time or another, but the most common by far are sulfur dioxide, carbon monoxide, hydrogen sulfide, hydrogen fluoride, chlorine and its compounds, nitrogen oxides, and hydrocarbons, These gases are reviewed with respect to their specific sources, analysis, and abatement.

14183 APTIC NO. 31864

Fannarino, Joseph Michael, Michael Samuel Graniere, Jr., Anthony John Comis, and Frederic E. Stynler

APPARATUS FOR THE TREATMENT OF EXHAUST GASES. *(Tri-Sciences Industries Inc., Utica, N. Y.) West Ger. Pat. 1,476,618. March 19, 1970. (Appl. Oct. 27, 1966, 7 claims). Translated from German. Associated Technical Services, Inc., Glen Ridge, N. J., 13p.*

A design for a direct-flame afterburner that can be used for the purpose of burning the exhaust gases by a primary combustion process is described. Air from a second source is supplied to the combustion zone at above-atmospheric pressure, in order tosupport the combustion. The ignition device is designed to produce an electrical discharge by way of a high-voltage spark gap. A second combustion zone, connected in series with the first zone, and a final outlet is provided; the ignition device in the second zone, serves to ignite the residual combustible gases which travel from the first zone to the outlet. A baffle is provided on the up-stream side of the ignition device in order to improve the mixing of the exhaust gases with the air that supports the combustion, and to reduce the back-pressure that works against the incoming gases and air. Channels to transfer the heat from the combustion zone surround a heat-conducting jacket, and baffles are provided in the way of the flow to guide the burning gases towards that jacket and to reduce the backpressure. The primary combustion zone has two channels, which diverge beginning at the inlet zone, and whose cross-sectional area is approximately equal to that of the inlet zone. The secondary combustion zone has a cross sectional area equal to approximately three-and-one-half times that of one channel, while the outlet for the combustion products has a cross-sectional area equal to approximately one third of the area of the second combustion zone. (Author summary modified)

14184 APTIC NO. 31922

Federico, I. di

PURIFICATION OF FUMES IN URBAN CENTRAL HEATING PLANTS. *(La depurazione dei fumi nelle centrali di riscaldamento urbano). Text in Italian. Ingegneria (Italy), no. 3:193-204, March 1971.*

Modern means used for the control of combustion pollutants in thermal plants are reviewed in detail. Dust control is achieved by dry or humid dust removers, dust filters, and electrostatic or sonic precipitators. The selection of the dust control device depends largely on the chemical composition, temperature, volume, density, abrasion characteristics, presence of water vapors and, especially, the size of the dust particles to be removed. Gaseous pollutants are controlled by absorption or adsorption systems. Absorption can be carried out in various types of towers, venturi scrubbers on wet scrubbers. Liquid compounds used for absorption purposes should have characteristics such as low vapor tension, lack of inflammability, ease of regeneration lack of corrosion and low cost. In adsorption systems, the gas comes in contact and is adsorbed by a granular porous material; fluidized bed adsorption systems are rarely used. Adsorption systems for the control of combustion induced air pollution are still the experimental stage. Criteria for the efficient disperison of combustion pollutants by means of well designed chimneys are emphasized. Special attention is paid to the role of meteorological factors in the design of chimneys and subsequent dispersion of pollutants.

14185 APTIC NO. 32395

Ferrari, S., M. Lucchesi, P. Maggini, and L. Praloran

RESEARCH WORKS ON ATMOSPHERIC POLLUTION AND CONSIDERATIONS ON THE USE OF GERMICIDAL ULTRAVIOLET-RAY BULBS IN SANATORIA. *(Richerche sull inquinamento atmosferico e considerazioni sull uso delle lampade a raggi ultravioletti negli ambienti sanatoriali). Text in Italian. Ann. Ist. Carlo Forlanini, vol. 27:105-118, 1967. 1 ref.*

Air samples from particular rooms of the C. Forlanini Institute were studied from a microbiological and morphological point of view in order to demonstrate the germicidal activity of ultraviolet-ray bulbs in sanatorial practice. Samples were filtered with Miquel filters to remove mycobacteria present in the air. A part of the product on the filters was inoculated into selective media and another part was inoculated into guinea pigs. Agar-Sabouraud plates were contacted with air. A total of

102.1 cu m of air was filtered with 59 Miquel sugar filters, and 32% were positive for mycobacteria with a total of 134 colonies. Inoculation of the colonies into guinea pigs showed no tubercular involvement. Mycobacterial typification tests confirmed that the isolated strains were saprophytes. Thus, the use of ultraviolet-ray bulbs does not thoroughly sterilize the surrounding air. The bulbs only partially decrease the isolated bacterial flora. In order to attain complete sterilization, the activity of the bulbs must be applied to restricted rooms where air is not entirely replaced. (Author abstract modified)

14186 APTIC NO. 32167

Fitzgerald, J. J. and C. G. Detwiler

COLLECTION EFFICIENCY OF FILTER MEDIA IN THE PARTICLE SIZE RANGE OF 0.005 TO 0.1 MICRON. *Am. Ind. Hyg. Assoc. Quart., no. 18:47-54, March 1957. 13 refs.*

The Hollingsworth and Vose-70 filter medium and the air cleaning filter media (CC-6, MSA-1106-B, and AEC-1) tested were significantly more efficient in the collection of submicron particles than the Whatman-40 and -41 filter papers. However, with a proper selection of the face velocity, relatively high collection efficiencies can be achieved even with the use of the Whatman filter papers. In the filter efficiency studies, all air sampling filter media investigated were more efficient for the collection of liquid potassium permanganate particles in the size range of 0.01 to 2.1 micron than for corresponding sizes of solid duraluminum particles. In the size range of 0.005 to 0.1 micron, the Whatman-40 and -41 filter papers are more efficient in the collection of solid duraluminum particles than in the collection of KMnO4 particles. The optimum particle sizes for penetration through Whatman-40 and -41 filter papers occurred at approximately 0.03 and 0.02 micron, respectively, at a velocity of 150 cm/sec. The minimum efficiency under these conditions was 90%. (Author summary modified)

14187 APTIC NO. 32389

Foard, James E.

WITH CURRENT TECHNOLOGY CAN COPPER SMELTERS MEET PROPOSED AIR QUALITY STANDARDS? Arizona Univ., Tucson, Engineering Experiment Station Proc. Air Pollution Control Seminar, Tucson, Arizona 1970, p. 101-125. 16 refs. (Feb. 13.)

NTIS: N70-39319

It is the function of copper smelters to extract metal from copper-bearing materials which are principally in the form of concentrated sulfide ores. Smelter emission problems are determined in large measure by the nature and properties of these concentrates. Conventional copper smelting practices are described, and the problems facing smelters in controlling emissions are indicated. Reverberatory offgas usually contains from 0.7 to 2.0% sulfur dioxide, while the mechanics of introducing finely divided concentrates or calcines into the turbulent atmosphere of a reverberatory furnace results in a high degree of particulate entrainment in the offgas stream. Although a considerable amount of solid material becomes entrained in converter offgas streams, much of it is relatively coarse and drops out along the flue system. Gas produced in modern roasters, more properly called fluid-bed reactors, is characterized by its uniform flow and relatively high SO2 concentration, which may be 15% or more. Roaster gas is normally devoid of oxygen and has to be diluted in order to have the necessary oxygen for oxidation of SO2 to sulfur trioxide, a basic reaction in the manufacture of sulfuric acid. Current processes and technology which may have application in solving these emission problems include flash smelting, use of tonnage oxygen, dry sorption of SO2, wet sorption of SO2, and various hydrometallurgical processes.

14188 APTIC NO. 31890

Foltin, Jan

ATMOSPHERIC AIR CLEANING. *(Cisteni atmosferickeho vzduchu). Text in Czech. Zdravot. Tech. Vzduchotech., 14(3):125-134, 1971. 3 refs.*

Types of secondary filters (for atmospheric air) made in Czechoslovakia are reviewed with special emphasis on electric filters. Four typical applications of electric separator cells are described: cleaning of large quantities of air during continuous operations or during double-shift or three-shift discontinuous operations; cleaning of medium quantities of air with discontinuity; cleaning of small quantities of air in a building-brick system with horizontal conditioning units. A portable recirculation separator is also mentioned. A procedure for evaluating filter quality is presented, and the filters reviewed are compared with reference to function, front surface, operation, operating costs, and safety. The results favor the electric separators. (Author abstract modified)

14189 APTIC NO. 32262

Fraiman, R. S., V. G. Syrkin, and V. L. Volkov

SEPARATION OF FINELY DISPERSED POWDER FRACTIONS IN A SERIES OF CYCLONES. *Khim. Prom. (Moscow), 34(7):494-498, 1961. 7 refs. Translated from Russian. Associated Technical Services, Inc., Glen Ridge, N. J., 8p.*

Finely dispersed fractions of powder were separated with adequate sharpness in a series of cyclones. Changes in the content of solid particles (by weight) in the incoming gas stream and the difference in the granulometric composition of the initial powder did not have an appreciable effect on the separation of finely dispersed fractions. Within certain limits, an increased gas flow made it possible to separate narrower fractions. Repeated separations of a powder increased the degree of extraction; however, the granulometric composition of the separated fractions deteriorated somewhat. (Author summary modified)

14190 APTIC NO. 30660

Freudenthal, Peter

HIGH COLLECTION EFFICIENCY OF THE AEROTEC-3 CYCLONE FOR SUBMICRON PARTICLES. *Atmos. Environ., 5(3):151-154, March 1971. 5 refs.*

The Aerotec-3 cyclone, a widely used instrument for the removal of coarse particulates from airstreams, was calibrated with micron and submicron diameter aerosols. The calibration procedure used is described. Because of technical difficulties, no tests could be made for particles between 0.292 and 0.929 millimicron. However, reasonable estimations of efficiencies for these intermediate size particles were made. The Aerotec-3 is 50% efficient for 0.6 millimicron density particles. The higher efficiency of the Aerotec-3 is probably due to several factors, including a new design and a radially, rather than tangentially, mounted inlet port. Also, the polydispersed, irregularly shaped mineral dusts used in earlier calibrations are difficult to size. It is concluded that this cyclone is much more efficient than previously supposed. (Author abstract modified)

14191 APTIC NO. 30660

Freudenthal, Peter

HIGH COLLECTION EFFICIENCY OF THE AEROTEC-3 CYCLONE FOR SUBMICRON PARTICLES. *Atmos. Environ., 5(3):151-154, March 1971. 5 refs.*

The Aerotec-3 cyclone, a widely used instrument for the removal of coarse particulates from airstreams, was calibrated with micron and submicron diameter aerosols. The calibration procedure used is described. Because of technical difficulties, no tests could be made for particles between 0.292 and 0.929 millimicron. However, reasonable estimations of efficiencies for these intermediate size particles were made. The Aerotec-3 is 50% efficient for 0.6 millimicron density particles. The higher efficiency of the Aerotec-3 is probably due to several factors, including a new design and a radially, rather than tangentially, mounted inlet port. Also, the polydispersed, irregularly shaped mineral dusts used in earlier calibrations are difficult to size. It is concluded that this cyclone is much more efficient than previously supposed. (Author abstract modified)

14192 APTIC NO. 31988

Fukaya, Toshihiro

ON DISPOSAL OF WASTES FROM A PAPER WARE MANUFACTURING PLANT. *(Shiki kojo no haikibutsu shori ni tsuite). Text in Japanese. Nenryo Oyobi Nensyo (Fuel and Combustion), 38(7):59-62, July 1971.*

Processes for the disposal of waste matter from a papier-mache plant are discussed. The corrugated cardboard trash is sent to a cyclone separator and then to an automatic paper trash packing machine. When a water ink is used, a considerable quantity of waste water is discharged. This waste liquor is stored in a tank and used to dissolve starch paste in the bonding machine. The ink is also decolored. The chemical flocculation/flotation and activated sludge methods are used to remove the starch waste liquor. A high chimney is not an economical measure to guard against soot and smoke, since the boilers used in a cardboard manufacturing plant are of small capacity. Therefore, this problem is solved with a double-structure chimney. The inner stack is insulated by the outer stack from the outside atmosphere, so that temperature differences between the inner stack and the smoke are kept to minimum. This helps avoid the emission of soot.

14193 APTIC NO. 32018

Galeano, Sergio F. and Byron M. Dillard

PROCESS MODIFICATIONS FOR AIR POLLUTION CONTROL IN NEUTRAL SULFITE SEMI-CHEMICAL MILLS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 25p., 1971. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-87.)*

In the kraft process, a ton of wood chips generally will produce about a half-ton of pulp, or a yield of 50%, while the semi-chemical process will produce a yield of 80%. Sulfur compounds are active cooking ingredients in the production of 95% of the pulp made by chemical or semi-chemical processes. In the last five years, however, the pulping industry has made significant advances in reducing sulfur gaseous emissions through process modifications and source control. Different process modifications introduced at one mill in Tomahawk, Wisconsin, and another in Big Island, Virginia, are described. The methodology and concepts used to minimize total reduced sulfur and total sulfur oxide emissions from the recovery furnace of the Tomahawk operation are explained. Thermodynamics of the combustion process and proper turbulence were instrumental in achieving reduction of sulfur compound emissions from this unit. Conventional hydrogen sulfide emissions from the sulfiting tower, on the order of eight to 10 pounds per ton of pulp, have been completely eliminated by a process modification technique in the Big Island mill. Primary air requirements, the amount of secondary air needed, and the optimum degree of turbulence are indicated. Control of nitrogen oxides is also discussed. It is important to remember that whenever steps are taken to reduce water pollution levels by chemical recovery, air pollution problems are increased in a chemical pulping process.

14194 APTIC NO. 32139

Gartrell, F. E.

WATER POLLUTION POTENTIAL OF AIR POLLUTION CONTROL DEVICES. *In: Air Pollution. Arthur C. Stern (ed.), Vol 3, 2nd ed., New York, Academic Press, 1968, Chapt. 49, p. 535-549. 22 refs.*

Devices for air pollution control which reduce the amount of waste material discharged to the atmosphere usually increase the quantities of such materials that must be disposed of by other means. Wet collectors of many types are used for air cleaning and all types contribute to the total quantity of liquid wastes which may be discharged to waterways, with or without treatment. With industrial development, urban population growth, and rapidly expanding use of water for all purposes, the accompanying need for stream pollution control has led to the establishment of agencies with the authority to regulate the discharge of waste materials to surface waters. From a review of water quality standards, it is obvious that many waste materials considered as air pollutants of major concern are likewise objectionable for many water uses, when present in even fairly low concentrations. This is particularly true of wastes involving fluorides, sulfur compounds, and radioactive materials. The control of fluorine wastes from uranium ore processing, phosphate fertilizer production, and steel mills, is discussed. Radioactive waste disposal practices at the Oak Ridge National, the Argonne National Laboratory, and at the Los Alamos Scientific Laboratory are described. The control of sulfurous wastes is indicated for copper smelters and electric power plants. The control of fly ash, dust, and other particulate wastes from calcium carbide plants, blast furnace operations, power plants, and chemical plants is reviewed.

14195 APTIC NO. 32232

Gartrell, F. E. and J. C. Barber

POLLUTION CONTROL INTERRELATIONSHIPS. *Chem. Eng. Prog., 62(10):44-47, Oct. 1966. 3 refs.*

Air pollution and water pollution control in industrial applications are closely related. Waste products are discharged for dilution and transport from their source into the atmosphere or a watercourse. They are discharged to open waste lagoons, storage areas, or, as in the case of high level, long-lived radioactive fission products, to permanent storage in closed containers. Devices for air pollution control which reduce the amount of waste material discharged to the atmosphere usually increase the quantities of such materials that must be disposed of by other means. Waste gas control in an ammonia plant, fluorine control in a phosphate plant, and fly ash control in coal-fired power plants were discussed. A scrubbing system was developed for the removal of ammonia from the gases given off when the copper solution was regenerated. Ammonium carbonate, the liquid waste, replaced about 36% of the ammonia previously supplied as ammonium hydroxide. Fluorine is controlled by a jet-venturi fume scrubber. Accumulated fly ash is pulled from collector hoppers by an induced vacuum. The vacuum is produced by a vertical venturi ringed internally with downward directed water nozzles. The water and ash are discharged into an air-separator tank which removes air from the mixture. The ash sluice water then flows by gravity or is pumped to the ash ponds. The ash settles in the pond; the overflow is discharged to the nearest watercourse.

14196 APTIC NO. 32039

Gies, J. R.

THE VISIBLE SMOKINESS OF FLUE GASES AND BASIC INFORMATION ON THE DEGREE OF DUST REMOVAL BY MECHANICAL AND ELECTRICAL CLEANERS OF FLUE GASES. *Braunkohle, 39(8):71-75, 1940. Translated from German by I. R. Campbell. 14p., June 1957.*

The dust density of the effluent does not determine the visible smoke effects, however, the fineness does. For an evaluation of the visible smokiness of flue gases from the firing of pulverized fuel, it is necessary that the characteristic particle curve of every type of coal, especially lignite, and of every mine or deposit be known. The dust removal efficiency and visible smokiness of fly ash No. 3 by the electrical filter and the cyclone were investigated. The electrical filter reached a total dust removal efficiency of 98.1% and an optical efficiency of 92.7%. For the cyclone, the corresponding values were 77.5% and 57.0%. The values for fly ash No. 2 were electrical filter, 94.2% and 86.9%, and the cyclone, 57.4% and 33.7%. For fly ash No. 1, the corresponding values were electrical filter, 92.0% and 85.3%, and cyclone, 42.0% and 30.1%. The values clearly show that in the case of pulverized fuel firing, only electrical filters give the required degree of purification.

14197 APTIC NO. 32417

Haas, J. E.

DETOXIFICATION OF EXHAUST GAS THROUGH AFTERBURNING. *Preprint, Rheinisch-Westfaelischer Technischer Uberwachungs-Verein e.V., Essen (West Germany), 1970. Translated from German, 15p.*

An exhaust emission reducing system was described. The system consists of an exhaust gas inlet, fresh air opening, expanding and heating body, pressure nozzle, draught nozzle and diffuser, heating element, flame chamber, and exhaust gas outlet. The afterburner is economical to install and eliminates poisonous hydrocarbons and transforms carbon monoxide into carbon dioxide. The afterburner and muffler may be combined without increasing exhaust back pressure. The afterburner is maintenance free and does not influence the function or load of the engine. It is mounted in the exhaust line between the engine and the tail pipe. The exhaust gas draws in fresh air automatically as it passes a pressurizing nozzle installation. The fresh air then mixes with the exhaust gas to create a combustible mixture; the combustion is undertaken in a second ignition chamber. The ignition temperature is 605 C. In this region of 12.5 to 74 vol %, the necessary temperature is created by a heating element to insure destruction of the carbon monoxide. The toxic effects of CO are also mentioned.

14198 APTIC NO. 32415

Hall, J. Alfred

UTILIZATION OF DOUGLAS-FIR BARK. *Forest Service, Portland, Ore., Pacific Northwest Forest and Range Experiment Station. 138p., 1971. 451 refs.*

The Douglas-fir region annually produces about 1.5 million tons of bark that must be disposed of some way. Increasing public demand for abatement of air pollution, e.g., from wigwam burners, makes imperative exploration of all possibilities of commercial use of Douglas-fir bark. The physical and chemical makeup of old-growth Douglas-fir bark are unique and lend encouragement to increased attempts to find uses for it. An historical survey is given of the many efforts to develop and market products based on physical separation of the bark into its principal fractions: cork, fiber, fines. Wax is obtained by solvent extraction of whole bark and from the cork fraction after treatment with alkali. The tannin from Douglas-fir bark belongs to the general class of condensed, catechol, or phlobatannins, according to the nomenclature preferred. Dihydroquercetin is distinguished as the only pure chemical compound that has been made from Douglas-fir bark in commercial amounts. The phenolic acids and the adhesive compositions are also mentioned. Power fuel, domestic fuel, pyrolysis, charcoal manufacture, and agricultural uses of Douglas fir bark are discussed.

14199 APTIC NO. 32274

Hammons, G. A. and A. Skopp

A REGENERATIVE LIMESTONE PROCESS FOR FLUIDIZED BED COAL COMBUSTION AND DESULFURIZATION. (FINAL REPORT). *Esso Research and Engineering Co., Linden, N. J., Government Research Div., APCO Contract CPA-70-19, APTD-0669, 115p., Feb. 28, 1971. 21 refs.*

NTIS: PB 198822

An experimental study was conducted on a fluidized bed coal combustion system using lime as a bed material. The lime reacts with sulfur dioxide and oxygen to form calcium sulfate under oxidizing conditions, thus reducing SO2 emissions. The regeneration reductive of the sulfated lime back to CaO and recycle of the generated lime back to the combustor was investigated as a method of reducing fresh limestone feed rates to the system. The maximum efficiency of the three-inch diameter coal combustor used was 97% at a bed temperature of 1800 F, a superficial gas velocity of three ft/sec, and an excess air level of ten percent. The combustion efficiency decreased as bed temperature decreased, increased as superficial gas velocity decreased, was independent of the excess air level over a range of seven to 30%, and decreased with increasing bed height. Experiments were conducted in the fluidized bed combustor with batch charging quantities of freshly calcined lime. Experiments were also performed with respect to nitric oxide emissions. The NOx emissions from the fluidized bed combustor in a typical batch lime operation decreased as a run progressed. The reductive regeneration of the partially sulfated lime back to CaO was investigated. An economic comparison of the two fluidized bed boiler systems is included. (Author abstract modified)

14200 APTIC NO. 31996

Hardison, L. C.

WHERE AIR POLLUTION CONTROL STANDS AS AN INDUSTRY. *Instrument Society of America, Pittsburgh Pa., Proc. Instr. Soc. Am. Chem. Petrol. Instr. Symp., 11th Annu., Chicago, Ill., 1970, p. 12-16. (April 8-10.)*

Air pollution control is examined as a segment of industrial activity. The principal air-pollution sources are automobiles, utility electric plants, domestic heating, incineration, chemical processes, metallurgical processes, evaporation of paint and other coatings, and ventilation of food processing areas. The major pollutants are sulfur dioxide, carbon monoxide, nitrogen oxides, hydrocarbons, dusts, and fumes. Controls for these emissions include the electrostatic precipitator, mechanical collectors, fabric filters, wet scrubbers, and gaseous emission controls. The air pollution control problem is characterized from the viewpoint of manufacturers of abatement equipment and systems. The size and shape of the industry, the incentives to manufacturers and their responses, and the potentials for pitfalls and profits are examined.

14201 APTIC NO. 32248

Hardison, L. C. and H. R. Herington

STUDY OF TECHNICAL AND COST INFORMATION FOR GAS CLEANING EQUIPMENT IN THE LIME AND SECONDARY NON-FERROUS METALLURGICAL INDUSTRIES. (FINAL REPORT). *Industrial Gas Cleaning Inst., Inc., Rye, N. Y., Air Pollution Control Office Contract CPA 70-150, 293p., Dec. 31, 1970. 17 refs.*

NTIS: PB 198137

Members of the Industrial Gas Cleaning Institute collected and formalized information on air pollution control for processes in the lime and secondary non-ferrous smelting industries. The specific process areas covered are: rotary lime kilns, brass and bronze reverberatory furnaces, lead cupolas, lead and aluminum sweating, lead reverberatory furnaces, zinc calcination, and aluminum chlorination. The processes in question are described, as well as the problems special to the processes and the associated air pollution control equipment. Specifications and cost estimates to serve each of the processes are considered. A tabulation of the past installations, and all of the available test data for each of these industries after January 1, 1960, are presented. Control equipment discussed included wet scrubbers, fabric collectors, electrostatic precipitators, and venturi scrubbers. Operating conditions, fuels, and emissions are also mentioned.

14202 *APTIC NO. 32479*

Harima, Mikio

DESULFURIZATION OF COAL GAS - APPLICATION OF CLAUS SYSTEM SULFUR RECOVERY PROCESS. (Sekitan gasu no datsuryu - Kurausu shiki iwo kaishu purosesu no oyo). Text in Japanese. Aromatikkusu Aromatics, 23(4):10-22, Apr'l 1971. 3 refs.

The Claus process, widely used for the recovery of sulfur from hydrogen sulfide during fuel oil desulfurization was examined for recovering sulfur from hydrogen sulfide in coal gas. A device designed to recover sulfur from crude oil by the Claus method is described by a process flow chart and floor layout. A key to the control of this process is proper adjustment of the ratio between H_2S and sulfur dioxide. Also discussed are coal gas treatment processes applied in the U. S., including a method in which, by hydrogenation, gas qualitatively equivalent to fuel gas is obtained from coal, while high-purity sulfur is recovered at the same time. Other processes in which fuel gas is manufactured from coal by hydrogenation are considered with respect to sulfur balance when sulfur is recovered from H_2S or from SO_2 discharged from H_2S and at the pretreatment process. Although costing more, the latter method is more desirable from the viewpoint of air pollution prevention. Also evaluated are the direct oxidation and split-flow sulfur recovery processes. The effect of recovered sulfur on the price of fuel is shown. Economic aspects of sulfur recovery methods used by various firms are briefly examined.

14203 APTIC NO. 32459

Hartman, M. and K. Grigar

DESORPTION OF SULFUR DIOXIDE FROM THE SYSTEM K_2O-SO_2-C_6H_5COOH- H_2O. *Intern. Chem. Eng., 10(3):351-361, July 1970. 22 refs. (Also: Chem. Prumysl, no. 1:1-9, 1970.)*

Potassium terephthalate is a product of a new method for the production of terephthalic acid using the disproportionation of potassium benzoate. Free terephthalic acid is removed from the solution by sulfur dioxide. Since it is necessary to recirculate SO_2 back to the process for economic reasons, a study was undertaken to find a desorption process which could form the basis for the design of equipment to accomplish this. The relationship between the partial pressure of SO_2 and the composition of the solution was derived. Experiments were undertaken to determine thermodynamically consistent equilibrium data for the liquid-vapor system. Applications of the results and costs are discussed.

14204 APTIC NO. 31918

Hashino, Genbei

EXHAUST GAS CLEANER FOR AUTOMOBILE OR THE LIKE. *(Jidosha nado no haiki gasu joka sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 46-16168. 2p., June 5, 1971. 1 ref. (Appl. Jan. 30, 1967, claims not given).*

A device for cleaning automobile exhaust gas sprays water on the exhaust immediately outside the exhaust pipe. Thus, while the gas is being scrubbed, dust on the road is also wetted and prevented from being blown away by the exhaust gases. A water tank is installed in the rear trunk of a car. A water pipe from the bottom of the tank is bent at some proper point so that it may run along the upper side of the exhaust pipe up to the end of the exhaust pipe. The end of the water pipe is provided with an atomizer nozzle facing downward. The water pipe is also equipped with a control valve that can be operated by remote control from the driver s seat. For example, the valve can be linked by wires to a manual switch device installed on the dashboard. When the switch is turned right, for example, the valve opens. An air pipe from an air compressor is fitted into the top side of the water tank to blow pressurized air into the tank, so the water in the tank becomes pressurized. The valve is opened when the engine is in idling position of in low-speed driving. Therefore, the exhaust gas is scrubbed with atomized water when discharged from the exhaust pipe.

14205 APTIC NO. 32394

Hashizume, Minoru, Kuro Shimoto, and Tsuyoshi Iwasaki

ELIMINATION OF WHITE SMOKE EXHAUSTS FROM PLATING PROCESS WITH MOLTEN ZINC. *(Yoyu aenmekki purosesu kara hassei suru hakuen no haiki hoshujokyo). Text in Japanese. Preprint, Japan Society of Safety Engineering, Tokyo, p. 78-79, May 1970. (Presented at the National Symposium on Safety Engeering, 1st, Tokyo, Japan, May 1970, Paper 39.)*

An economically feasible method of removing white smoke from a molten zinc galvanizing kettle was developed. The experiment leading to the development of the system used a kettle 2.7 m by 1.2 m by 1.5 m. A slot hood cover was attached alone one long side of the kettle, and baffle plates three m high were affixed to the other three sides. With an air intake speed of 120 ft/min at the height of 10 cm above the surface of the kettle, the obnoxious white smoke was removed with a minimum wind volume of 240 cu m/min, and without being affected by the turbulence in the working room. For the actual elimination of components of the smoke, such as ammonium chloride, zinc chloride and ammonia, bag filters were the most appropriate, since they prevent clogging of the filter material due to the coagulated chemicals in the smoke. The coagulated chemical components on the filter can be dislodged twice a day by air pulses, so that efficiency does not deteriorate.

14206 APTIC NO. 31909

Hatakeyama, Risaburo

EXHAUST GAS CLEANER. *(Haiki gasu no seijo sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 46-16482. 2p., June 9, 1971. 2 refs. (Appl. Feb. 1, 1971, claims not given).*

In an exhaust gas cleaner, the absorbent solution is circulated through a radiator and cooled to avoid vaporization losses. The cleaner consists of a purification tank and the radiator. The purification tank has a multistage filter filter unit comprising two or more cone-shaped filters mounted on a rod suspended from the top cover of the tank. The gas-liquid mixture is cooled by the radiator and returned to the purification tank. When exhaust gas is taken into the gas-liquid mixture pipe, it mixes with the absorbent solution and moves to the radiator. The turbine is then operated, with the moving gas-liquid mixture to turn the radiator fan. The mixture, cooled by the radiator, is jetted into the tank. Then the gas and solution move upward through the filter unit to the discharge pipe. This completes one cycle of the cleaning/cooling process. When the absorbent solution becomes dirty, it is removed through the outlet in the bottom of the tank; fresh solution is poured into the tank from the feed-in port provided in the top cover.

14207 APTIC NO. 32134

Hausknecht, E. G.

THE USE OF A GAS TURBINE IN WISCONSIN STEEL WORKS SINTERING PLANT AIR POLLUTION CONTROL INSTALLATION. *Preprint, 7p., Nov. 30, 1970.*

Two induced draft fans, used to draw gases through an electrostatic precipitator are powered by 100 hp gas turbines. Approximately 75 to 100 tons/day of flue dust, with an iron content of about 60% is collected from the precipitator and transported to the sintering plant. A new waste gas cleaning system was installed in series with the dust collecting system. This system was designed to limit the particulate matter of the stack discharge to 0.02 grains/standard cu of gas. A 180 deg bend was installed in the old stack. The gases then pass downward through a venturi section equipped with water sprays and into the bottom of a moisture eliminator. The gases are drawn to the top of the eliminator by a fan, powered by another 100 hp gas turbine, and are discharged to a new stack. Initial installation cost and operating cost influenced the use of a gas turbine.

14208 APTIC NO. 32111

Hayashi, Shigenobu and Norihiro Sawa

A STUDY ON THY IMPROVEMENT OF COMBUSTION AND EXHAUST GAS IN THE INTERNAL COMBUSTION ENGINE (1ST REPORT). *(Nainenkikan no nensho to haishutsu gasu no kaizen ni kansuru kenkyu (Dai ippo). Text in Japanese. Muroran Kogyo Daigaku Kenkyu Hokoku (Mem. Muroran Inst. Tech., Sci. Eng.), 7(1):239-263, July 1971. 8 refs.*

Combustion characteristics of the cylinder of an internal combustion engine and the mechanism of carbon growth in a sealed combustion chamber were studied. Propane-air gas in a hermetically sealed cast-iron container was ignited by an engine ignition plug. The changing state of the combustion flame was measured and the change of combustion pressure was recorded. Velocity, appearance, and combustion pressure, as well as combustion flame propagation, were examined. A wire net was inserted into the combustion container to study the effect of disturbance of the combustion flame on the flame propagation and pressure line. Ignition delay and flame propagation velocity fluctuated drastically; the latter increased with the progress of the flame. When the flame was disturbed, the combustion and flame propagation velocities decreased immediately after the flame passed the net but increased again thereafter. The increase in flame propagation velocity was higher for the excessively thick mixture gas than for the excessively thin mixture gas. The flame propagation velocity and pressure rise were greater when the flame was disturbed in the later combustion stage. Hydrocarbon emission was primarily due to the flame-quenching effect of the combustion chamber wall, but was also generated by imperfect combustion of the too-thick air-fuel ratio. The determining factors for hydrocarbon generation were air-fuel ratio and surface area - volume ratio, which increased not only the flame quenching range but also the change of the combustion condition. The effect of the operating condition on hydrocarbon emission from a crankcase compression-type two-cycle gasoline engine during light-load operation was studied.

14209 APTIC NO. 32037

Hazard, Herbert R.

INDUSTRIAL PROCESSING. *In: The Federal R and D Plan for Air- Pollution Control by Combustion-Process Modification. Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., APCO Contract CPA 22-69-147, Rept. APTD-0643, p. IV-1 to IV-22, Jan. 11, 1971. 5 refs.*

NTIS: PB 198066

Combustion for thermal processing in industry, which includes all uses of heat for processing, but does not include steam generation, power generation, or space heating, is discussed. The principal sources of pollutant emissions in thermal processing are: iron production, steel production, cement and lime production, glass melting, aluminum production, brick, tile, and ceramics production. Emissions that are large enough to warrant attention are combustible particulates, polynuclear aromatics, oxides of nitrogen, and sulfur oxides. Nitrogen oxides are formed by oxidation of the nitrogen in the fuel and in the combustion air, under conditions of high temperature in the presence of oxygen. Thus, formation of NOx can be minimized by minimizing flame temperature, burning under reducing conditions, and two-stage burning which achieves low flame temperatures and reducing conditions. Research and development approaches toward reduction of NOx through combustion modification are discussed.

14210 APTIC NO. 31966

Helion, R. and C. Delatronchette

THE NEW ELF FUEL COMBUSTION PROCEDURE. *(Nouveau procede elf de combustion des fuels). Text in French. Pollut. Atmos. (Paris), 13(50):111-115, April-June 1971.*

Three burners fed by an oil-water emulsion have been in operation at a power plant since October 20, 1969. A 90-95% by weight reduction of particulate emissions occurred while operating with a slight excess of air (5-20%). The emission of sulfur dioxide was practically identical whether just fuel or an emulsion was burned and depended solely on the sulfur content of the fuel. The emission of sulfur trioxide depended on fuel sulfur content and the excess of air employed in the combustion. Since the ELF process takes place at a moderate excess of air, SO2 emission is kept at a low level. This also applies to nitrogen oxides. Comparative tests with pure fuel and with the emulsion disclosed that the temperatures of the waste gases were 216 and 164 C respectively. The expenditure of heat for the vaporization of the water in the emulsion was just about compensated by the reduced heat loss. Heat output thus was identical in both methods. Corrosion due to SO2 and SO3 emission is potentially lower in the emulsion method because it operates with a reduced excess of air. From an economic point of view, the process can be applied to installations with a minimal heat output of 300 Kcal/hr. All it requires is a mixing device and a water proportioner. The requirements on water quality are outlined.

14211 APTIC NO. 32116

Hironaka, Yasusaburo

INCINERATOR. *(Jinkai shokyaku sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 46-23198. 2p., July 2, 1971. (Appl. Sept. 4, 1968, 1 claim).*

An incinerator is presented to handle large quantities of wet garbage or low-temperature refuse rapidly, as well as to produce a combusted gas which can be used for fuel. The apparatus comprises a garbage feed hopper, low-temperature reaction furnace, high-temperature reaction furnace, ash discharge device, and water-filled ash retainer tank. The low-temperature reaction furnace is bottomless with a number of holes in its side walls. A smoke discharge pipe is connected to the part of the outer casing which encloses the low-temperature reaction furnace. There is space between the bottom of the low-temperature reaction furnace and the top of the high-temperature furnace, with the oil or gas burner fitted into the lower side wall of the outer casing so that the burner tip will be located in this space. Between the ash discharge port and the open bottom of the high temperature reaction furnace is a rotary drum-like fire grate designed to discharge ash while shielding the interior of the outer casing from the outside atmosphere. A water outlet pipe is provided near the bottom of the low-temperature reaction furnace, while an air blower is installed on the lower part of the high-temperature reaction furnace.

14212 APTIC NO. 32364

Hirschler, D. A.

MEETING FUTURE AUTOMOBILE EMISSION STANDARDS. *Preprint, National Petroleum Refiners Association, Washington, D. C., 18p., 1970. 8 refs. (Presented at the National Petroleum Refiners Association Annual Meeting, San Antonio, Tex., April 6-7, 1970, Paper AM-70-5.)*

A broad research program being conducted on vehicle emissions and the factors that affect them is described. Ways have been sought to improve the preparation of fuel-air mixtures so that a nearly uniform mixture of fuel and air is available to each cylinder of the engine under all driving conditions. Steady-state, light-load dynamometer engine data are presented that illustrate some of the benefits of lean mixture operation and good mixture preparation. Carbon monoxide, nitrogen oxide, and hydrocarbon emissions are indicated. To enable satisfactory operation at lean mixtures, experimental high-velocity carburetion has been developed. Ignition timing has been modified, and ways to conserve heat in the exhaust system have been developed. Other design improvements are indicated. Emissions standards for particulates and the portion of lead compounds present are discussed, and on-going studies of the feasibility of reducing exhaust particulates by trapping devices are noted.

14213 APTIC NO. 31974

Hoad, John G.

GAS WASHER APPARATUS. *(Hoad (John G.) and Associates, Inc., Ypsilanti, Mich.) U. S. Pat. 3,577,709. 5p., May 4, 1971. 7 refs. (Appl. May 9, 1968, 6 claims).*

A gas washer apparatus removes dust and other particulates from exhaust gases associated with various metallurgical and chemical processes. The sources of the gases may be rotary kilns as used in cement, lime, expanded aggregate and similar processes, or from a cupola, blast furnace, or similar furnace which discharges exhaust gases carrying particulate matter. Since exhaust gases were often hot and carried particulate matter, previously used gas scrubbing devices were rather costly and subject to corrosion. The present invention comprises a single or multiple spray tower combined with a settling basin. The spray tower is mounted directly over the settling basin so that the wash or spray water which is discharged falls into it. The dust laden gases pass upward through the spray tower, countercurrent to the water flow, and discharge as relatively clean gases.

14214 APTIC NO. 32424

Hoegger, D.

THE PROBLEM OF LEADED GASOLINE. *(Das Problem der Benzinverbleiung). Text in German. Bull. Eidgenoess. Gesundheitsamtes, Beilage B, no. 3:71-104, March 1971.*

The Federal Commission for Air Hygiene of the Swiss Department of Health has considered the problem of leaded gasoline by reviewing its effect on humans, animals, and plants and by studying latest published research findings on the problem. As a result, it proposed to the Department of the Interior on October 9, 1970 to order a reduction of the lead content in premium gasoline to 0.57 g/Pb/l and in regular gasoline to 0.54 g Pb/l effective Jan. 1, 1972 and to change the currently valid ordinances accordingly. Increased lead emission by automobile exhaust gases, the contamination Zurich s air, street dust, plant life, and milk, and the effect of lead emission on humans are discussed. The Commission has concluded that while lead from exhaust gases contaminated especially areas adjacent to highways and that while persons exposed to these gases for long periods of time had a somewhat elevated blood lead content, no imminent danger from this source exists in Switzerland for either man, plant, or animal life. In spite of this conclusion, the Commission proposed to put a higher tax on premium than on regular gasoline to discourage its use, to plant green belts along highways, to introduce more frequent drinking water and food quality controls, to limit vehicular traffic in city centers, and to tax powerful engines more heavily than at present to discourage their use.

14215 APTIC NO. 31986

Honda, Hidemasa and Shinjiro Watari

SPHERICAL ACTIVATED COAL AND ITS FUTURE APPLICATION. *(Kyukei kasseitan to sono shorai eno oyo). Text in Japanese. Industrial Water Technology Assoc. (Japan), TR-1, 25p., April 1969.*

Spherical activated coal is being used to prevent air and water pollution. The activated coal must be strong, have good adsorption capacity, and be stable, cheap, and readily available. A medium-size pilot plant was used in experiments with activated coal. Characteristics of different coals and differences in reaction processes caused by internal structure variations were clarified, but some problems remain to be solved before the information is put to practical use. Treatment of coking coal at 600 to 700 C resulted in increased internal surface. Its ash content was less affected. In the manufacturing method developed, almost all the coal can be used as raw material for spherical activated coal, diameters can be freely adjusted, and a high yield of good coal is obtained. Spherical activated coal is easy to handle and use; the yield is 35 to 45% of the coal used. The production cost is $238.00 for 4000 tons/yr. Adsorption of activated coal depends on the inner porosity and surface energy. The necessary experimental equipment is being constructed for a special project to begin eg., in 1969 to study activated coal.

14216 APTIC NO. 32119

Ichikawa, Michio

PLASTIC WASTES DISPOSAL. *(Plastic haikibutsu shori). Text in Japanese. Preprint, Smaller Enterprises Promotion Corp. (Japan), 10p., 1971. 7 refs. (Presented at the Public Nuisance Prevention Technique Seminar, Japan, 1971.)*

Characteristics of the incineration of various plastics, the substances generated, and their volume and compositon after burning are tabulated and described. Incinerator temperatures must be kept high to assure that the plastics are completely burned. The volume of wastes to be burned and the air needed for burning must also be regulated. If the wastes are in excess, the air will be reduced and too much smoke will be produced; however, if there are not enough wastes, the air will be in short supply, and the incinerator temperatures will be lowered. If harmful gases such as hydrogen chloride are generated, the exhaust gases must be cleaned or neutralized. Other emissions include carbon monoxide, carbon dioxide, nitrogen, oxygen, and polyvinyl chloride. It is often necessary to crush or pulverize the plastics before incineration. Fireproof materials should be used for incinerator construction. In order to lower the costs of incineration, the heat from the process should be utilized. Rotary type and whirling air current type incinerators are described. Fluidized bed combustion is suitable for eliminating odors and for wastes with little water and low-temperatures.

14217 APTIC NO. 31944

Igarashi, Misao

DESULFURIZATION OF STACK GAS BY BAHCO METHOD. *(Bako ho ni yoru haien datsuryu). Text in Japanese. Netsu Kanri (Heat Management: Energy and Pollution Control), 23(7):25-28, July 1971.*

Since low sulfur fuel oil is difficult to obtain and not much heavy oil desulfurization equipment is in operation, the control of sulfur oxides must depend upon their elimination by absorption. High chimney stacks do not present a solution either, since the volume of sulfur dioxide discharged is not decreased. The Bahco scrubber for desulfurizing smoke from small oil burners comprises a conical shaped part and cylindrical part, with two-stage scrubbing. Smoke is pressurized by a blower and enters the bottom scrubber. When the gas passes through the space between the lower edge of the conical part and the absorbing solution at high speed, droplets are formed due to pressure differences and friction between the liquid and gas. The absorbing droplets come into contact with the gas, and the S02 in the gas and the dust in the smoke are absorbed by the liquid. Droplets gather on the walls and are passed into a tank due to centrifugal force. The gas goes into the second stage and goes through the same process as the lower stage. Sodium, potassium, calcium, or magnesium slurries can be used.

14218 APTIC NO. 31910

Ishii, Kenichi

EXHAUST GAS CLEANER FOR INTERNAL COMBUSTION ENGINE. *(Nainen kikan haiki gasu joka sochi). Text in Japanese. (Tokyo Roki K. K. (Japan))*

Japan. Pat. Sho 46-16167. 1p., June 5, 1971. 1 ref. (Appl. Dec. 23, 1966, claims not given).

A catalyst exhaust gas cleaner was designed for easy replacement of the catalyst and easy combination of two or more catalytic units into one unit when necessary. The catalyst unit is placed where it least hampers the exhaust gas flow. The cleaner has an oval pipe-like casing. The catalyst chamber is placed in a horizontal position, with its center line as the horizontal center line of the unit. The chamber is enclosed with plates; gas enters and leaves through a number of fine holes in the upper and lower plates. If two or more units of this cleaner are to be combined to handle a large quantity of gas, the cover with the discharge port is attached to the discharge side of the second unit. Thus, exhaust gas enters the intake-side gas chamber, flows upward through the catalyst chamber in which the gas contacts with the catalyst to burn the harmful contents, and goes into the discharge-side gas chamber, where it is finally discharged through the discharge port. The catalyst is replaced by simply removing the nut on the detachable cover of the catalyst chamber and replacing the old catalyst with a new one.

14219 APTIC NO. 32013

Ivey, Lee R.

WHEN POLLUTION PROBLEMS OUTWEIGH THE PROCESS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1971. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-17.)*

The seemingly endless occurrence of air pollution control problems in one moderately sized manufacturing plant and the many types of controls used to combat these problems are described. It was demonstrated that air pollution emissions do not always emerge from a process one at a time or each one from a separate process step, ready to submit to one obviously indicated corrective apparatus. The may come in twos and threes simultaneously and one may reduce or destroy the effectiveness of the control device which may be ideal for some one of the others. It was also shown that in such a situation, with no one control device qualified to handle all of the combined pollutants satisfactorily, a change of changes in the process may be necessary. Emissions dealt with include hydrogen sulfide, ammonium salt fumes, hydrogen chloride, paint, solids and solvents, and heat. (Author abstract modified)

14220 APTIC NO. 31915

Jaeger, W. and T. Keilpart

POLLUTION CONTROL CAN PAY ITS WAY--EVEN WHEN RETROFIT. *Elec. Light Power, 48(6):73-75, June 1970.*

A new wet scrubber that can be retrofit on existing coal-burning installations is described. It will remove 99.2% of the particulate matter and all but 60 ppm of sulfur dioxide from a gas stream. The new separator uses a water base scrubbing or rinse liquid containing an alkaline additive for absorption of the S02. It has two sections. Hot flue gas enters the bottom section which is a cooling tower containing Raschig rings. As the gas is cooled it passes to the upper section where it is mixed with the scrubbing liquid. This upper portion contains a stack of polypropylene discs, shaped in cross section so that they cause the mix to sharply accelerate, then decelerate as it flows radially outward from the center. This change in velocity breaks down surface tension so that rinse liquid picks up the particulate matter and causes the submicron size particles to agglomerate. The saturated liquid collects in a settling tank where it is continually drawn0 off while the clean gas continues on toward the stack. Because of its efficiency and the purity of the by-product, ammonia is recommended as the alkaline additive. The remainder of the system converts the ammonia-sulfur compounds to 99% pure ammonium sulfate for sale as fertlizer. A method to calculate costs is included.

14221 APTIC NO. 32151

Jordan, Harry S. and Leslie Silverman

EFFECT OF PULSATING AIR FLOW ON FIBER FILTER EFFICIENCY. *Harvard Univ., Cambridge, Mass., Air Cleaning Lab., Contract AT (30-1)841, NYO 4814, 49p., Dec. 15, 1961. 29 refs.*

Submicron particulate removal efficiency was determined for a fiberglas filter medium at several constant aerosol stream velocities and the results compared to those for the same filter subjected to a sine wave form pulsating airflow (simulating human respiratory airflow pattern) at the same mean stream velocities. Experimental results indicate that filter efficiency, under conditions of pulsating flow at a given mean velocity, cannot be predicted from efficiency values obtained under conditions of steady flow. Collection efficiencies under conditions of pulsating flow are higher at low mean velocities and lower at high mean velocities than efficiency obtained under conditions of steady flow at corresponding velocities. Theoretical considerations were examined and three factors postulated for the observed difference: a basic change in the flow pattern through the filter, a change in the number of effective impactions, and the removal of deposited particles. Respiratory protective equipment would represent the princial application of filtration under conditions of pulsating flow. Another aspect of interest is the possibility of a potential application to pulsating flow from fans which could affect in-line filter devices. In the range of mean velocities expected in the use of filter masks, the effect of pulsating flow would be to increase the collection efficiency of the filter element. A simple readily constructed spinning disc homogeneous aerosol generator is described. (Author summary modified)

14222 APTIC NO. 31826

Joyce, R. S., R. T. Lynch, R. F. Sutt, and G. S. Tobias

EFFECTIVE RECOVERY OF DILUTE SO2. *Preprint, American Institute of Chemical Engineers, New York, N. Y. and Inst. Mexicano de Ingenieros Quimicos, Mexico City, 24p., 1970. 6 refs. (Presented at the American Institute of Chemical Engineers and the Instituto de Mexico Ingenieros Quimicos, Joint Meeting, 3rd, Denver, Colo., Aug. 30-Sept. 2, 1970.)*

The feasibility of a continuous process for the carbon catalyzed oxidation of sulfur dioxide in gas streams was demonstrated on a bench scale. The product is a sulfuric acid solution up to 15% by weight. In a series of factorial experiments controlling variables in the process were the oxygen/SO2 mol ratio and gas contact time. Temperature also has an effect on the reaction rate although this cannot always be controlled. The relationship of the percent of SO2 oxidation to the O2/SO2 ratio and contact time was established, and optimum operating conditions were predicted. Advantages of the process were high conversion efficiencies for dilute SO2 streams, catalyst longevity, and simplicity. Using the bench scale data, economic projections for two potential applications were made. These applications were the reduction of SO2 emissions from copper smelting reverberatory furnaces and abatement of SO2 in stack gas from contact sulfuric acid plants. In both cases the projection showed the carbon process to be economically feasible and capable of significant SO2 abatement. (Author summary)

14223 APTIC NO. 32464

Kane, John M.

WET PARTICULATE COLLECTORS FOR EFFLUENT CONTROL. *Preprint, American Foundrymen s Society, Des Plaines, Ill., 3p., 1970. (Presented at the Total Environmental Control Conference, Ann Arbor, Mich., Nov. 16-19, 1970.)*

For most foundry particulate producing operations, high performance collectors will likely be either wet types or fabric types for the near future. The historical background for control of foundry emissions is reviewed. Wet particulate collectors for foundry service may be divided into four groups by the pressure loss ranges employed. Impaction and direct interception forces are employed, supplemented in some designs with centrifugal and/or dynamic forces. The impact between particle and water droplet increases the mass of the wetted particles making it easier to remove from the gas stream. Wet cap, tower, orifice, dynamic, and venturi designs are cited. Operating characteristics of wet collectors are listed. Saturation efficiency and water utilization are reviewed.

14224 APTIC NO. 32461

Kangas, J., E. Nyholm, and J. Rastas

SMELTER GASES YIELD MERCURY. *Chem. Eng., 78(20):55-57, Sept. 6, 1971.*

A technique was developed which scrubs the sulfur dioxide-rich gases from smelter or roasting operations of mercury before the gas is processed for sulfuric acid production. At the Kokkola plant of Outokumpu Oy (Finland), zinc concentrates are roasted in a fluidized-bed furnace at at temperature of 950 C. Mercury sulfide contained in the concentrate decomposes completely and mercury vaporizes. The heat contained in the gases is recovered in a waste heat boiler, and dust is separated from the gas by means of cyclones and electrostatic precipitators. Mercury-containing gases coming from the electrostatic precipitators at a temperature of 350 C go to the sulfatizing unit. The mercury sulfatizer is a brick-lined tower containing ceramic packing, in which mercury-bearing gases contact a countercurrent flow of strong sulfuric acid. Mercury and selenium are scrubbed from the gas by the acid. Sulfuric acid flows from the bottom of the tower to an intermediate storage tank, it is then pumped through a heat exchanger and recycled to the tower. Zinc and iron salts, as well as chlorides and fluorides, can also be removed in this process. Washing the precipitate, and the production of metallic mercury are mentioned.

14225 APTIC NO. 31772

Kawahata, Masayuki

APPARATUS FOR REMOVAL OF SULFUR DIOXIDE FROM WASTE GASES. *(General Electric Co., Schenectady, N. Y.) U. S. Pat. 3,574,562. 4p., April 13, 1971. 13 refs. (Appl. Nov. 29, 1968, 4 claims).*

Previous methods to control the sulfur dioxide constituent of waste gases have employed either contact between the gaseous reactants in the presence of a solid catalyst or contact in the presence of solutions of the catalyst material, but not both. A method is described in which the reaction between oxygen and sulfur dioxide in the presence of an entrained solid catalyst and in the presence of an aqueous catalyst sulfate is carried out simultaneously. Also of considerable importance is the provision and utilization of a very large number of contact-reaction sites moving along the path of gas flow. Catalysts are manganese dioxide and manganese sulfate.

14226 APTIC NO. 31766

Kawauchi, Kaoru

DESULFURIZATION EQUIPMENTS OF STACK GAS BY YOSHIMINE-WET-SYSTEM. *(Yoshimine shisshiki haien datsuryu sochi). Text in Japanese. Netsu Kanri (Heat Management: Energy and Pollution Control), 23(7):35-39, July 1971.*

Desulfurization of heavy oil is being tackled by the oil companies as a national project, while the control of sulfur dioxide exhaust emissions is being entrusted to the power companies. Basic data have been collected at Yoshimine Company s Kyoto Plant pertaining to the volume of water circulated, gas and water temperatures, the avoidance of white smoke, dust control, the prevention of metal corrosion, and other variables in treating sulfur dioxide in exhaust emissions. In smaller boilers, the effluent is not considerable, so the small amount of recovered materials are difficult to sell. However, they cannot be discharged either. At the Kyoto Plant, the effluent is kept in a settling tank, and the supernatant is regulated to pH seven. Desulfurization equipment comprises a double cylindered tower, installed between the boiler and the stack. In the inner cylinder, the hot gases are cooled from 300 to 90 C; in the outer cylinder, the cooled gases flow upward while the absorbing solution flows downward. The treated gas, now at about 80 C, is led to the stack, and a 0.5% caustic soda solution is used as neutralizer to absorb the S02. A coil-shaped heat exhanger, immersed in the lower part of the inner cylinder, cools the neutralizing solution from 70 C to about 40 C. The desulfurization can be carried out with a small volume of solution, and heat can be recovered. The lining used is rather expensive. The nozzle is made of stainless steel and various pipes are made of vinyl hydrochloride.

14227 APTIC NO. 32451

Kazakov, V. N.

TEST OF AN ELECTROSTATIC FILTER WITH TRANSVERSE GAS FLOW. *(Ispytaniye elektrofil tra s poperechnym khodom gaza). Text in Russian. Tsvetn. Metal., 44(3):48-52, 1971. 8 refs.*

The process of dust deposition in electrostatic filters was analyzed. The effectiveness of air purification by filtration through the counterflow of electrons and ions was tested in an electrostatic filter PKhG. The design of the filter is described, and technical data is presented. The dust content in the air at the entrance into the filter was seven to eight g/cu m. When the working voltage on the filter was 60 kV, dust content in purified air was four to five mg/cu m. The voltage on the electrofilter was the factor determining the effectiveness of air purification. The dependance of purification effectiveness on voltage of the electrostatic filter was determined. The mechanism of the gas purification in the electrostatic filter in the presence of counter corona (i.e., when the specific electric resistance fo the dust layer is higher than 10 to the 12th power ohm times cm) was studied and clarified.

14228 APTIC NO. 31925

Kimura, Masahiko and Koji Ohyagi

REPORT ON A TEST OF AN APPARATUS NAMES CO-CUT. *(CO katto seino shiken). Text in Japanese. Kokushikan Daigaku Kogakubu Kiyo (Kokushikan Univ. Dept Eng. Trans.), no. 4:50-60, March 1971.*

Basically a small air filter combined with an air feeder pipe, CO-CUT is a carbon monoxide control device, connected to the intake manifold of the automobile engine. When the piston descends and produces negative pressure in the intake manifold, filtered air is sucked into the intake manifold through the air feeder pipe. This intake of secondary air into the air/fuel mixture ensures the complete combustion essential for the removal of CO. The CO-CUT device was tested with water-cooled four-cycle automobile engine. Dynamometer load, rpm, fuel consumption, CO concentration in the exhaust gas, pressure differential in the intake pipe orifice, boost pressure, lubricant temperature, and water temperature were determined. Shaft torque, shaft output, volume of air going through the CO-CUT device, and the air intake volume through the carburetor were also calculated. The CO-CUT device was especially effective in the idling mode when emissions were cut by about 70%. Fuel consumption efficiency was also improved.

14229 APTIC NO. 31946

Kinugasa, Yoshihiro, Osamu Shimizu, Tadaaki Kawasugi, and Hiroyuki Hamano

RESEARCH ON JET TYPE SLUDGE INCINERATION SYSTEM. *(Funryu shiki odei shokyaku shisutemu ni kansuru kenkyi). Text in Japanese. Kankyo Gijutsu Kenkyusho Hokoku (Bull. Ind. Environ. Control Res. Lab.), 6(1):36-41, Aug. 1970. 11 refs.*

The new Jet Type Sludge Incineration System features a furnace with a jet bed, a hybrid of the conventional fluid bed and the comparatively new spouted bed. Specifically, the lower part of the jet furnace, where a circulating fluid bed of supplied sludge may be formed, is moderately tapered. The conventional fluid-bed furnace has an untapered bottom and the spouted bed has a sharply tapered bottom. Performance data are reported for a model plant employing the new incineration system, which incorporates drying/granulation and/or burning processes. If desired, the system can be used only for drying and granulating sludge, or only for combustion of sludge. The furnace requires no fluid medium such as sand and less space than other furnaces, and assures stable high-load performance. Even when clinker is generated, it is easily discharged from the furnace with minimum damage to furnace walls. In the absence of a fluid medium, pressure loss is low, so operating costs are reduced. Auxiliary fuel can be saved by the effective use of the heat from the harmless and odorless waste gas and by perfect combustion. The furnace is easily automated.

14230 APTIC NO. 32427

Koberstein, Edgar and Eduard Lakatos

HIGH-TEMPERATURE OXIDATION CATALYST FOR THE PURIFICATION OF AUTOMOTIVE AND INDUSTRIAL WASTE GASES. *(Oxydationskatalysator zur Verwendung bei erhoehter Temperatur, insbesondere fuer die Reinigung von Abgasen aus Verbrennungsmotoren und Industrieanlagen). Text in German. (Deutsche Gold-und Silber-Scheideanstalt Vormals Roessler, (West Germany)) West Ger. Pat. 1,283,247. 2p., Nov. 21, 1968. (Appl. Sept. 24, 1965, 3 claims).*

While the catalytic activity of oxides of heavy metals on an aluminum oxide base suffers at high temperatures from reactions among the solid substances, such catalysts can be rendered very active and stable at high temperatures if the concentration of oxides is very high. Thus a catalyst consisting of aluminum oxide and of between 55 and 90% by weight of two metal oxides (chromium and titanium, vanadium, manganese, iron, cobalt, nickel, copper, or zinc) will, with the addition of air, oxidize carbon monoxide and organic pollutants in automotive or industrial exhaust gases at high temperatures. The catalyst is prepared by the precipitation of nickelchrom oxide with 6% barium from a mixed ammoniacal solution of ammonium chromate, nickel nitrate, and barium nitrate; and by subsequent drying, pulverization, mixing with aluminum oxyhydrate, kneading, drying, tabletting with stearic acid, and calcining at 500 to 800 C in a muffle furnace. Barium can be substituted by 0.5 to 10% by weight of beryllium, magnesium, calcium, or strontium. Used in accordance with provisions of the California Test Procedure and Criteria for Motor Vehicle Exhaust Emission for the oxidation of automotive exhaust gases, the catalyst converted 92% CO to CO2 at 0 km, 77% CO to CO2 after 5000 km, and 70% CO to CO2 after 20,000 km.

14231 APTIC NO. 31985

Kondo, Masahisa

EXHAUST GAS PURIFICATION DEVICE MAKING USE OF SUPERSONIC WAVES. *(Choonpa o mochiita haiki gasu no joka bunri sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 46-23101. 4p., July 1, 1971. (Appl. Nov. 30, 1967, 1 claim).*

An automobile emission control device is described in which the exhaust gas is purified simultaneously with the removal of particulates. The device is a cyclone type separator equipped with a pressurized water jet nozzle and supersonic oscillator. As pressurized water is jetted through the nozzle, the exhaust gas is sucked into the device and the harmful gases are separated, oxidized, and reduced in the high-tension supersonic cleaner, while gas components are dissolved in water and the particulates absorbed. These harmful gases include carbon monoxide, carbon dioxide, hydrocarbons, lead compounds, sulfurous acid mist, sulfur dioxide, and similar pollutants.

14232 APTIC NO. 32319

Konopka, A. P.

PARTICULATE CONTROL TECHNOLOGY IN PRIMARY NON-FERROUS SMELTING. *Preprint, American Inst. of Chemical Engineers and Inst. Mexicano de Ingenieros Quimicos, 10p., 1970. 9 refs. (Presented at the American Institute of Chemical Engineers and Institute Mexicano de Ingenieros Quimicos Joint Meeting, 3rd, 0Denver, Colo., Sept. 1970.)*

The sources and nature of particulate emissions and control technology in the primary smelting of aluminum, copper, lead, and zinc are described. The high dust concentrations generated by bauxite drying and alumina calcining frequently require multicyclones for preliminary collection, followed by electrostatic precipitation. Installed costs for the combined system are $4.60-$2.30/CFM, at 99+% collection efficiencies. Electrolytic aluminum reduction cells pose a more complicated emission problem: moderate-energy wet scrubbers, glass filter bags, or flushed precipitator installations are used. Representative installed costs for the three methods are $3.00/CFM, $2.00/CFM, and $2.00/CFM, respectively. Dry electrostatic precipitators, preceded by mechanical collectors, are universally applied in copper smelting. Installation costs for the combined equipment are $6.00/CFM for 50,000 CFM flows and $3.00/CFM for 2,000,000 CFM flows. Large lead blast furnaces employ electrostatic precipitators, smaller units use fabric filters. Installation costs of vertical flow pipe-type precipitators in the 100,000 CFM range are $6.00/CFM. Continuous baghouses for smaller volumes cost $5.00/CFM installed. Horizontal flow plate precipitators are used on new zinc sintering machines. Mild-steel construction is common, and installed costs for 50,000 CFM collectors are $3.50/CFM. Emissions from flash roasting of zinc ore are also controlled by plate-type precipitators of mild steel construction. Installed costs are $3.50/CFM.

14233 APTIC NO. 31955

Krambrock, W.

CALCULATION OF THE CYCLONE SEPARATOR AND PRACTICAL CONSIDERATIONS FOR ITS LAYOUT. FIRST PART. *(Die Berechnung des Zyklonabscheiders und praktische Gesichtspunkte zur Auslegung. Teil 1). Text in German.0 Aufbereitungs Technik, 12(7):391-401, July 1971. 16 refs.*

Following an historical outline on the development and applications of the cyclone separator, operational and experimental calculation methods are indicated for determining pressure loss and separating efficiency. Dust-laden gas enters the cyclone tangentially and rotates downward in the collection chamber and exits at the bottom. The pressure drops as the radius of the rotary movement diminishes. Dust particles are thrown to the wall by centrifugal force. Diagrams for the aerodynamic coefficients, pressure-loss coefficients, separating efficiency curves for different grain sizes and data on slot and spiral inlets and deflectors complete the principles for the layout of cyclones. Reference is made to problems of optimization, agglomeration, formation of accretions, wear, and dust discharge. Parallel and series-connected cyclones are compared.

14234 APTIC NO. 31776

Kranc, Marion F. and John R. Lutchko

REMOVAL OF CARBON MONOXIDE AND NITRIC OXIDE WITH COPPER CHROMIUM IMPREGNATED ON A SUPPORT. *(Calgon Corp., Pittsburgh, Pa.) U. S. Pat. 3,576, 596. 10p., April 27, 1971. 7 refs. (Appl. Oct. 13, 1967, 13 claims).*

A process is described for removing carbon monoxide and nitric oxide from air, flue gas, automobile exhausts and ammonia synthesis gas. Present procedures are expensive and only partially successful. The gas mixture is passed at a temperature not over 125 C through a high surface area of activated carbon support impregnated with copper-chromate, the chromium being in the hexavalent state. The exhausted impregnated activated carbon is regenerated with an oxygen containing gas at 100 to 200 C.

14235 APTIC NO. 31879

Kunda, W. and B. Rudyk

AQUEOUS REDUCTION OF SULPHUR DIOXIDE BY PYRROTITE TO ELEMENTAL SULPHUR.

Can. Met. Quart., 9(4):551-561, 1971. 6 refs.

Sulfur dioxide reacts with natural or synthetic pyrrhotite (FeS) in an aqueous system to form elemental sulfur and ferrous sulfate. The effects of reductant, quantity of reductant, SO2 pressure, agitation, temperature, and presence of impurities on the rate of reaction were studied. The reaction took place with favorable rate at 150-225 F and at 30-90 psig SO2. Elemental sulfur in the leach residue was recovered by dissolution with ammonium sulfide solution or tetralin, or by volatilization. The unreacted pyrrhotite, after suitable treatment, was recycled to the process. Cupric sulfate, cobalt sulfate, and nickel sulfate inhibited the reaction of SO2 with pyrrhotite. The addition of coal promoted the formation of elemental sulfur. (Author abstract modified)

14236 APTIC NO. 32127

Kurkin, V. P., I. I. Urbakh, and V. N. Uzhov

PURIFICATION OF GASES FROM SOOT.

(Ochistka gazov na sashevykh zavodakh). Text in Russian. Zh. Vses. Khim. Obschestva im. D. I. Mendeleeva, vol. 14:421-426, 1969. 27 refs.

Gas purification methods are discussed including cyclones, glass fiber filters, and others. Some of the most widely used methods for soot removal are surveyed, which differ according to soot origin. The scope and limitations of these methods are indicated, and problems are discussed.

14237 APTIC NO. 32016

Lang, Andrews M.

SOLID WASTE DISPOSAL WITHOUT AIR POLLUTION.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 13p., 1971. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-106.)

The increasing difficulties arise upon attempts to improve the air pollution potential of incineration, the primary solid waste disposal method now being used in most urban areas. The intensive compaction method developed by the Japanese was evaluated. This method achieves the same levels of volume reduction as incineration but without any possibility of attendant air pollution. Air pollution control devices now add about 10% to the cost of an incinerator, and this proportion will increase as the allowable particulate levels go lower. Running an incinerator to cope with the variation in material being processed means a constant job of adjusting and modifying operating procedures. The newer disposal method of compaction is based on pressure in excess of 3000 psi. The principle of the system is to simply compress all kinds of waste (intermixed) to form a bale or block or cube which is then either deposited in a landfill or put to use in construction of rip-rap walls, embankments, and other utilitarian projects. In the Japanese system, extremely high levels of compression are achieved by going through these separate stages of compression (in the receiving hopper, in a preliminary compression chamber, and in the main compression chamber), by utilizing two separate strokes of the main compression ram, and by spot compaction using small cylinders built into the main ram. The compression levels achieved are higher than those obtainable with any other system and routinely produce a bale that is heavier than water.

14238 APTIC NO. 32260

Lepsoe, Robert

HISTORY OF THE TRAIL SMELTING PLANTS.

(Historien om Trail smelteverk). Text in Norwegian. Tidsskr. Kjemi Bergvesen Met., 7(2):22-25, Feb. 1947.

The history of this plant, located in the Canadian province of British Columbia, on the Columbia River just north of the U. S. border is reviewed. The plant produces metallic lead, zinc, cadmium, gold, tin, elemental sulfur, and sulfur dioxide gas (for commercial use). At an earlier period, the company had serious problems with lead poisoning among its workers, but the institution of regular checkups, including blood tests, of workers in contact with lead, combined with proper medical treatments and other personnel policies, has almost eliminated the problem. Extensive research has been done at the plant on the problem of recovering sulfur products from the roasting gases. Among the absorption media tested are zinc oxide, limestone, basic aluminum sulfate, and organic bases. Granulated lead slag has been found extremely effective as an absorbing agent, but at the same time its use is not economically profitable. The basic decision of plant management was to recover sulfur dioxide in a form in which it could be converted to elemental sulfur or sulfuric acid. Reducing SO2 with coke is complicated by the fact that coke is so expensive locally. On the other hand, there is an abundance of carbon monoxide available from thermo electric plants, which can be substituted for the coke.

14239 APTIC NO. 32365

Madelaine, Guy

STUDY OF THE DETAINING POWER OF VARIOUS FILTERS.

(Etude du pouvoir d arret de differents filtres). Text in French. Commissariat a l Energie Atomique, Saclay (France), Centre d Etudes Nucleaires, CEA-R-2432, 1963. 15 refs.

Part 1 describes a study of the detaining power of various filters for particles with a diameter larger than 0.3 micron, examining variations in their permeability as a function of filtering speed. Part 2 deals with the effectiveness of the same filters in detaining radioactive particles with a diameter of less than 0.1 micron when electrically charged. Method, experimental equipment, and characteristics of aerosol samples used are described for both investigations. The particulate samples included atmospheric dust, milk sugar, the product of a type RB fumigenic agent, and the smoke from a specially treated rope (5 mm in diameter, treated with lactic acid, benzoin, and potassium nitrate). Four types of filters: (1) blue filter (Schneider-Poelman, with a base of water-repellent alfa fibers); (2) yellow filter (a blend of alfa and asbestos fibers); (3) pink filter (same as yellow but with different proportions of the ingredients); and (4) St. Gobain non-flammable filter (mixture of superfine glass and asbestos fibers). For Part 2 experiments, the particulate sample was generated by a ceramic spark plug impregnated with radioactive thorium. The filtering, if constant, increases the permeability of the filter in inverse proportion to the diameter of the particles. If the filtering speed is varied, then the permeability increases rapidly up to a filtering speed of 2 cm/sec. Beyond this point the speed increases at a steady rate until it reaches 10 cm/sec, the maximum speed. The effectiveness of the ROYCO spectrometer for simple, rapid testing of filters was demonstrated.

14240 APTIC NO. 32103

Maeda, Hiroshi and Shigemitsu Komeiji

ELECTROSTATIC PRECIPITATOR FOR CUPOLA.

(Cupla yo denki shojin sochi). Text in Japanese. Imono (Foundry), 43(7):48-56, July 1971. 16 refs.

Electric dust collectors cannot collect dust with high electric resistance. In the past 10 years, stabilizers have been developed and techniques using sulfur trioxide and ammonia have been adopted to improve gas conditions. Little work has gone into developing the collector itself, and frequent spark discharges are still a problem. In Germany, this defect has been rectified by a frame-type electrode system. A cupola is usually operated with a pair, working alternately, and with one heat exchanger. Exhaust gas composition, dust content, and dust particulate diameter make dust collection extremely difficult in cupola operations. In the German system, all cupola gas is drawn through a combustion chamber and heat exchanger, then cooled with water sprays, and the dust collected. While the heat exchanger gets very dirty, all necessary improvements have been incorporated. In 1962, the cupolas control standard in Germany was 0.5 kg/t for a 20 t/hr furnace. Electric dust collectors are expensive but widely used for cupola and other emissions because of their reliability (some are capable of continuous operation for a whole year). Also, suitably sized ones can be designed and used irrespective of particulate diameter.

14241 APTIC NO. 31835

McIlvaine, Robert W.

THE DUST DIFFICULTY DETERMINATOR: A PRIMARY TOOL FOR DETERMINING EFFICIENCY SELECTION IN WET SCRUBBERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 36p., 1971. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-154.)*

The Dust Difficulty Determinator is a universal pilot plant. Information gathered from the use of this device will allow virtually any manufacturer of wet scrubbing equipment to select the right efficiency horsepower equipment for a given dust problem. It eliminates the guessing now prevalent in the field. This device uses a standard orifice plate as a scrubbing mechanism, with a variable pressure drop across the orifice. Therefore, the efficiency of the unit is variable. It is portable and can be installed and connected to existing ductwork in a plant, enabling it to capture a representative continuous sample of the actual dust at the source. By varying the pressure drop across the unit, a correlation between emission reduction and pressure drop and horsepower can be obtained. This information can be then used by vendors to select the right pressure drop equipment. It can be used by governmental agencies as a comparative yardstick or measuring device. For example, in three separate sinter plant studies it was determined that at 0.02 gr/cu ft, 15 in pressure drop was required in one plant, 40 in pressure drop in another, and 55 in pressure drop in a third. Without benefit of the dust difficulty determinations, it would be impossible to predict the difference in dust difficulty between these three seemingly similar processes. (Author abstract modified)

14242 APTIC NO. 32457

McKibbon, J. H.

SELECTION OF ELECTROSTATIC PRECIPITATORS TO MEET NEW POLLUTION CODES. *Can. Mining Met. Bull. (Montreal) 64(713):82-84, Sept. 1971. (Presented at the Canadian Institute of Mining and Metallurgy Annual General Meeting, 73rd, Quebec City, Quebec, April 1971.)*

The accepted method for sizing and predicting performance of any electrostatic precipitator is in accordance with the Deutsch-Anderson equation. The precipitator is usually used in smelting operations. A plot of this equation is presented which can be used to obtain plate area requirements/1000 cfm of gas for varying migration values and efficiency requirements. The key to the use of this formula is the correct establishment of the migration velocity. The value for the migration velocity is affected principally by gas water vapor content, gas sulfur trioxide content, dust size, and dust resistivity. Once the basic plate area requirement is established, the next step is to accommodate it most economically in a shell and, at the same time, conform to other design parameters which are not accounted for in the Deutsch equation, such as gas velocity, retention time, precipitator sectionalization, aspect ratio, gas distribution, and dust disposal.

14243 APTIC NO. 32261

McPhee, D. T.

POWER PLANT USING HIGH SULFUR COAL TAKES STEPS TO REDUCE AIR POLLUTION. *Ind. Water Wastes, vol. 8:9-11, 1963. (Presented at the Air and Water Pollution Conference, Missouri Univ., Columbia, Nov. 13, 1962.)*

The steam electric power plant discussed is located in a remote rural region near a high-sulfur coal deposit easily accessible by strip mining. On the basis of approximately 4% sulfur in the coal, it was decided to minimize pollution by installation of 85%-efficient mechanical dust collectors and a 250-ft stack. These measures were insufficient to prevent a tendency to ground-level pollution during certain temperature inversions. Moreover, the collectors demonstrated an extremely high rate of wear. The company is now installing two 300-ton 95%-efficient electrostatic precipitators and increasing stack height to 450 ft. It is expected that sulfur dioxide emissions will not exceed 0.30 ppm.

14244 APTIC NO. 32348

Meissner, Harold G.

MULTIPLE DWELLINGS. *In: Principles and Practices of Incineration. Richard Corey (ed.), New York, Wiley-Interscience, 1969, Chapt. 4B, p. 84-105. 1 ref.*

Rapid changes during the past few years in the characteristics and quantity of refuse collected in large apartment houses have greatly increased the problem of disposal and in many cases indicated the desirability of on-site incineration. Bottles and cans form a larger proportion of the material than plastic materials, comprising 60% or more of the residue. Fresh food products or garbage average only 10% of the total refuse so moisture content is low. Oversize noncombustible waste is very limited. The average heating value of the refuse is assumed to be 6000 Btu/lb as compared with the typical 5000 Btu/lb for municipal refuse. On-site incineration has the advantage of reducing the residue in volume and weight to a fraction of the original and finally to a sterile, odorless residue that can be hauled directly to a dump area, or stored without fire and health hazards. New incinerator designs and techniques for reducing the inherent problems, such as air pollution and smokeout, of on-site incineration are reviewed. Performance standards and construction specifications for new installations are outlined along with suggestions for their implementation. Also noted are methods of upgrading existing incinerators.

14245 APTIC NO. 31754

Miller, William C.

REDUCTION OF EMISSIONS FROM THE GRAY IRON FOUNDRY INDUSTRY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 33p., 1971. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-134.)*

The various particulate control methods and types of basic process equipment available to the small gray iron foundry are discussed and emission quantities, economic aspects, operating and maintenance procedures, and product quality control are compared. The most common method used for melting metal for gray iron casting is the cupola process. Other furnaces used include the electric arc furnace, electric induction furnace, and a gas or oil-fired reverberatory furnace. The four basic types of control equipment used on gray iron foundry cupolas are wet cap, multiple cyclone, wet scrubber, and fabric collector. In order for the small jobbing foundry to compete with larger plants and remain in business, the control equipment addition method of reducing air pollution emissions from the cupola melting furnace must be abandoned in favor of a more reasonable approach. The most satisfactory solution is the replacement of the cupola melting process with an oil or gas-fired reverberatory melting furnace.

14246 APTIC NO. 31990

Minemura, Katsuya

DESULFURIZATION OF STACK GAS BY ROTARY WASHING METHOD. *(Kaiten senjoho ni yoru haien datsuryu). Text in Japanese. Netsu Kanri (Heat Management: Energy and Pollution Control), 23(7):46-51, July 1971.*

No adequate equipment for the control of sulfur oxides has been found for the smaller boilers used for heating buildings. Recently, a rotary washing method has been utilized by the National Telegraph and Telephone Public Corporation to prevent the deterioration of their equipment by sulfuric acid gas. The rotary economizer recovers heat from boiler exhaust. The aim was to devise a sulfur dioxide control apparatus which was as compact as possible, and rotary equipment was selected since it has good contact between air and liquid. Gas absorption and dust elimination can be carried out simultaneously. Sulfuric acid gas can be absorbed in a short period of time when an alkali solution is released by the rotary sprayer in fine droplets. Very little special metal is used, so that the cost is low, and little maintenance is required, as the structure is simple.

14247 APTIC NO. 32498

Miyagawa, Toshiki

ON DORU METHOD FLUID INCINERATION EQUIPMENT. *(Doru shiki ryudo shokyaku setsubi ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 38(8):23-32, Aug. 1971.*

The Doru incinerator comprises a fluid layer of high temperature sand to which the dehydrated cake of sewage is supplied. As the dehydrated cake is briskly stirred in the fluid layer, it is burned completely in a short period of time. The incinerator is compact in size, costs less to construct, and is also inexpensive to repair since it has no metal parts. Odors in the gas are controlled as the incineration temperatures are high (700-800 deg). There is little excess air, and heat is recovered from the combustion gas. If the incineration is stopped for some time, operation can easily be resumed, since the sand stores heat. An example is given of sewage sludge with a 70-75% water content to be incinerated with equipment capable of handling 10 tons of dehydrated cake a day. The equipment comprises a cake feeder, reactor, heat exchanger, cyclone, scrubber, blower, and compressor. Silica sand is utilized.

14248 APTIC NO. 32098

Mizukami, Yukihiro

DISTRICT HEATING PLAN OF SAPPORO CITY. *(Sapporo-shi no chiiki danbo keikaku). Text in Japanese. Kuki Seijo (Clean Air -- J. Japan Air Cleaning Assoc., Tokyo), 9(1):52-58, April 1971.*

The district heating plan for Sapporo City is being pushed to be finished in time for the Winter Olympic Games in February 1972. When the plan is realized, air pollution in Sapporo will be decreased by 30 to 40%. The center of the city is divided into two areas to be served by the boiler plant, which is 10,000 cu m wide and about 0.5 km away. The north area will require 190 times 10 to the sixth power Kcal/H and the south area requires 120 times 10 the sixth power Kcal/H. The construction is in four stages. When the fourth stage is completed, boiler capacity will be 170 times 10 to the sixth power Kcal/H and can go up to 190 times 10 to the sixth power Kcal/H. Further construction will increase it further. Although the initial fuel will be coal, to encourage the coal industry of Hokkaido, possible alternatives will be reviewed when necessary. Instead of each building having its own boiler, each will be provided with a heat exchanger. The cost, estimated at less than one cent/1000 Kcal, is financed by the Pollutions Control Public Corporation. The business operation must be rationalized, and capital, fuel costs, and manpower must be reduced as much as possible. Although the boiler is to supply the district heat, it could also combine power generation and garbage incineration.

14249 APTIC NO. 31888

Morita, Tomijiro

DESULFURIZATION OF STACK GAS BY KUREHA METHOD. *(Kureha ho ni yoru haien datsuryu). Text in Japanese. Netsu Kanri (Heat Management: Energy and Pollution Control), 23(7):21-24, July 1971.*

The Kureha Chemical Company has been using a wet method to control the sulfur oxides in waste gases from a thermal generation plant by controlling the pH, sulfur dioxide is selectively trapped without absorbing carbon dioxide. When 50% sodium hydroxide solution is added to the absorbing liquid, crystals of sodium sulfite are separated, dried, and made into a product. The liquid is then recycled in the absorber. Generally, when 50% NaOH is used, it is necessary to eliminate 800 kg water/ton of product. However, in the case of high temperature stack gases, the water evaporates so that no heat source is required. Smoke from the boilers is sucked in by a fan, the dust is eliminated and the humidity controlled.

14250 APTIC NO. 31913

Moritz, K. H., H. R. Savage, D. Traficante, W. Weissman, and B. J. Young

DESULFURIZATION PROCESSES: THE GO-FINING AND RESIDFINING PROCESSES. *Chem. Eng. Progr., 67(8):63-68, Aug. 1971. 2 refs.*

Basic features, economics, and range of applicability of the GO-fining and RESIDfining hydrodesulfurization processes are described. GO-fining achieves relatively complete desulfurization of vacuum gas oils, thermal and catalytic cycle oils, and coker gas oils. RESIDfining desulfurizes atmospheric residua and deasphalted oils to produce fuel oils of less than one weight percent sulfur. In GO-fining, sulfur is removed without difficulty and with excellent catalyst activity and activity maintenance. The main limitation of the process is that it removes only 45% or less of the sulfur in the total fuel oil pool. The RESIDfining process can attain 60-70% pool sulfur reduction. In addition, it can provide a low-sulfur wide cut fuel oil that can be back blended with undesulfurized feed to provide a wide range of product fuel-oil sulfur levels. The hydrodesulfurization process operation is discussed in pilot plants. Investment costs are $8.9 million for RESIDfining and $5.45 million for GO-fining, while operating costs are 44 cents/bbl for RESIDfining and 21.1 cents/bbl for GO-fining. Both processes operate at the same low-pressure levels, making it feasible to expand a GO-fining unit to a RESIDfining unit at a later date.

14251 APTIC NO. 31795

Morse, W. L.

SMUTTING OF OIL-FIRED BOILERS AND ITS CORRECTION BY THE DCP SYSTEM. *Plant. Eng. (London), 14(8):186, 191-192, Aug. 1970.*

The D.C.P. Systems Ltd. method of injecting powder and oil-fired boilers is described, to prevent acid smuts from chimneys falling all around on property, cars, washing, and so forth, and to keep flues clean, so that weekend shutdown time is reduced. In the basic installation, a very fine spray of alkaline powder, (consisting mainly of calcium and magnesium carbonates), is injected into the flue gases to neutralize and dry up the acid condensation, and prevent the formation of carbon agglomerates. A special insufflator, the Alkajector, is used to inject the powder where it is most likely to be effective.

14252 APTIC NO. 31892

Muraki, Y.

DESULFURIZATION OF STACK GAS BY KBCA METHOD. *(KBCA ho ni yoru haien datsuryu). Text in Japanese. Netsu Kanri (Heat Management: Energy and Pollution Control), 23(7):5-8, July 1971.*

The Kurabo Bubble Contact Absorber (KBCA) is a wet method which can quite effectively control sulfur oxides under some conditions. It is most effective when the absorbent is not expected to be reused. Thus, a rather inexpensive absorbent must be readily available which can be disposed of without too much trouble. Any alkali substance which will react with sulfur dioxide or sulfur trioxide can be used. Exhaust gas from a boiler passes through a gas duct, is mixed with the absorbing liquid, then goes to a lower tank in fine bubbles. The bubbles gradually disintegrate in the bubble chamber, and enter a section where the gas and liquid are separated. Since the unreacted gas enters the absorbing liquid directly and does not come into contact with parts of the apparatus other than the special bubbling device, corrosion of the equipment is prevented. Also, there is no danger of clogging, as no filling material is used. Calcium hydroxide and ammonia are recommended as inexpensive absorbents.

14253 APTIC NO. 32233

Murrow, Jack

PLUGGING OF HIGH EFFICIENCY FILTERS BY WATER SPRAY. *California Univ., Livermore, Lawrence Radiation Lab., Rept-UCRL-50923, TID-4500, UC-38, 7p., Aug. 1970.*

NTIS: UCRL-50923

The effect of a water spray on the high efficiency particulate air filter performance was investigated. Quantity and droplet size of the spray were studied as functions of time and airflow. For testing, the nozzle was positioned to provide pattern coverage for the filter. A filter was sealed in place, and airflow was adjusted to 1000 cfm. Water was then turned on to operate the nozzle at 40 psig. During each test, a differential pressure was maintained across the filter, while the change in air volume was recorded in relation to time. At the termination of each spray test, the air flow was increased to 1000 cfm and the differential pressure across the filter recorded. The filter was then removed from the ducting and weighed. The increase from the dry weight was recorded as the amount of water retained. Very low flows of fine water droplets had only a small plugging effect on new filters. Increasing water flow and particle size increase the pressure drop across the filter, the rate of pressure drop, and the amount of water retained in the filter. High water flows of coarse droplets had a rapid plugging action, even though the amount of water retained was minimal. In addition, coarse droplets had an erosive action.

14254 APTIC NO. 31901

Myers, John G. and Joseph H. Field

METHOD OF REMOVING SULFUR OXIDES FROM GASES. *(Dept. of Interior, Washington, D. C.) U. S. Pat. 3,508,702. 6p., May 25, 1971. 5 refs. (Appl. Sept. 10, 1968, 5 claims).*

Well-known methods for removing sulfur oxides from gases include the addition of caustic agents, oxidation of S02 to S03 with subsequent absorption, reduction to sulfur, wet absorption, adsorption, and dry absorption with agents such as sodium aluminate or alkalized alumina. None of the methods is economical or practical. An improved technique is based on contacting flue gases at 300-600 C with a dry absorbent from the group consisting of red mud, retorted oil shale, a retorted oil shale treated with sodium hydroxide, or a mixture of red mud and retorted oil shale treated with sodium hydroxide. Red mud refers to the insoluble waste product resulting from the leaching of a bauxite ore with sodium hydroxide, retorted oil shale to oil shale with substantially all volatile matter removed. The absorbents can be used on a once-through basis or regenerated by treatment with a reducing gas. Catalytic oxidation may precede absorption, in which case contact temperature is from room to 600 C. The absorbents can also be utilized by injecting them as a powder into furnace gases and then removing the powder from the flue gas in a cyclone or electrostatic precipitator.

14255 APTIC NO. 31896

Nakajima, Yasuo and Yoshimasa Hyashi

DEVICE FOR SELECTIVE COMBUSTION IN A MULTICYLINDER ENGINE. *(Nissan Jidsha Kabrishiki Kaisha, Yokohama (Japan)) U. S. Pat. 3,578,116. 8p., May 11, 1971. 6 refs. (Appl. Nov. 13, 1968, 7 claims).*

When an internal combustion engine is coasting, the mixture of fuel and air fed to the engine does not burn completely in the combustion chamber. As a result, a large amount of hydrocarbons is exhausted to the atmosphere. A known method of improving combustion is to retard the spark advance during idling and to keep the engine revolving speed high. With a high revolving speed, the idling throttle valve opening is increased to allow the intake of a large amount of gas mixture during deceleration. The method has the disadvantage that the throttle cannot be opened widely due to the danger of overheating and the occurrence of run-on phenomenon. The present invention effectively prevents air pollution with a device for interrupting fuel supply to selected cylinders during deceleration and coasting. The device comprises valves mounted in selected cylinders, a mechanism for sensing negative pressure at the intake manifold, and a mechanism that operatively connects the pressure-sensing mechanism to the valves. The valves are closed by the pressure-sensing mechanism when the negative pressure at the engine intake manifold exceeds a certain predetermined level due to deceleration or coasting. When fuel supply to some cylinders is interrupted, the amount delivered to the remaining cylinders is increased. Accordingly, compression pressure also increases in the remaining cylinders. Because the compression pressure exceeds the combustion limit pressure, perfect explosion takes place in the cylinders receiving the gas mixture. (Author abstract modified)

14256 APTIC NO. 32115

Nakamori, Katsuichi and Hatsuichi Makimoto

WASTES INCINERATOR. *(Jinkai shokyakuro). Text in Japanese. (Nippon Kuritekku K. K. (Japan)) Japan. Pat. Sho 46-22774. 3p., June 29, 1971. 4 refs. (Appl. June 28, 1967, 1 claim).*

An incinerator was designed to accomplish more effective combustion of waste products such as plastics. The combustion chamber is divided into primary and secondary chambers by a vertical brick wall provided with holes. Walls of iron and brick enclose the chamber. Installed on the top of the secondary combustion chamber is a stack or chimney. Water atomizers are near the top of the secondary chamber, with water retainer pans underneath and a vaporizer pipe device attached to them. A screen net is mounted in an acutely inclined position above the atomizer unit and across the stack. A discharge port communicates directly with the lowest retainer pan in order to discharge excess water. The air intake wastes feeder inlet is provided in the upper side of the primary combustion chamber. Garbage and other wastes are burned first in the primary combustion chamber, then in the secondary chamber. Steam is generated in the secondary chamber as the combustion heats the vaporizer pipe and the exhaust gases ascend to the stack. Water is injected upward, and the inclined screen prevents a film from forming.

14257 APTIC NO. 31937

Namba, Seitaro and Takamasa Aonuma

DECREASE OF CATALYTIC ACTIVITY WITH STREAMING TIME IN THIOPHENE- HYDROGENOLYSIS OVER PRESULFIDIZED DESULFURIZATION

CATALYSTS. (Datsuryu shokubai deno chiofen suisoka bunkai hanno ni okeru kassei no keijiteki teika). Text in Japanese. Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), 74(7):1324-1327, July 1971. 3 refs.

In order to study the behavior of active species, the hydrogenolysis of thiophene over presulfidized desulfurization catalysts such as cobalt or molybdenum with alumina was observed in a flow reactor. Temperatures were varied from 335-380 C, pressures from 21-40 torr, and the flow rate of hydrogen gas from 50-100 mol/min. Presulfurization of the catalysts took place at about 450 C. The activity of the catalysts decreased over a period of time and then stabilized. The initial activity and stable activity were studied under these varying conditions.

14258 APTIC NO. 32117

Nemoto, Hisashi

TREATMENT METHOD FOR CONVERTERS EXHAUST GAS SCRUBBING WATER. *(Tenro haigasu shujinsui no shoriho). Text in Japanese. (Kurita Water Industries Co., Ltd. (Japan)) Japan. Pat. Sho 46-22390. 3p., June 25, 1971. 1 ref. (Appl. Aug. 20, 1966, 1 claim).*

Most of the iron oxide dust contained in exhaust gas from a non-combustible type converter is ferrous oxide, which is reduced to ferrous hydroxide when treated with scrubbing water. The pH of the scrubbing water must be adjusted to eight or higher if the ferrous hydroxide is to separate out as flocs with a conventional treatment method. With the addition of an alkali, the regenerated scrubbing water forms ferrous bicarbonate when contacted with the exhaust gas. Since the ferrous bicarbonate is easily soluble, there is poor sedimentation. When contacted with air at the cooling column of the regeneration process, iron hydroxide is produced which, together with calcium or magnesium ions present in the water, becomes hard scales which cling to the inner walls of the system components. A new process is described which avoids the formation of these scales. The scrubbing water is cooled, adjusted to a pH of seven or eight, and then led into the sedimentation tank to remove the solids. The effluent from the sedimentation tank has polyphosphate added to it before being fed back into the scrubber.

14259 APTIC NO. 31824

Nice, Minor and Simon Ostrach

LIQUID-GAS SEPARATION AND CONTAINMENT. *Case Western Reserve Univ., Cleveland, Ohio, Div. of Fluid, Thermal, and Aerospace Sciences, Grant AFOSR 68-1581, Proj. 9781-01, AFOSR 70-2259TR, FTAS/TR-70-49, 61102F, 681307, 109p., Aug. 1970. 17 refs.*

NTIS, DDC: AD 718992

The separation and containment of a liquid-gas mixture in a closed cyclone separator are considered. A set of performance curves giving the measure of containment as a function of Reynolds number for various separator geometries is presented. Special attention is given to the effect of geometric factors on the development of secondary flows within the separator, and results are presented which give the pressure drop across the separator as a function of Reynolds numbers for various modes of operation. From the experimental results presented, the operation of a cyclone separator can be concluded to be governed by three phenomena: end wall boundary layer flow, vortex breakdown, and cessation of collection. (Author abstract modified)

14260 APTIC NO. 32497

Nuranaka, Kuniyoshi

ON WASTE DISPOSAL FROM PETROCHEMICAL PLANT. *(Sekiyu kagaku kojo no haikibutsu hori ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 38(8):1-6, Aug. 1971.*

Wastes at the Chiba Plant of the Mitsui Petrochemical Company are plastics produced as by-products from polyethylene and polypropylene processes, but technical developments have provided for their use as fuels. A boiler now exists to burn the polymers. The volume of air is kept at 2-2.5 times the theoretical air volume, and the reactor temperature is maintained at 1100-1200 C. Gas flow and incineration velocity are kept high to avoid local excess heating. By constructing thermal cracking equipment, part of the low polymer by-product is used as fuel for the burner. An incinerator for plastics was constructed in September 1969 at the Chiba Plant and is capable of burning various wastes without odor and damage to the equipment.

14261 APTIC NO. 31911

Obata, Kinichi

COMBUSTION DEODORIZER. *(Nensho dasshu sochi). Text in Japanese. (Nikko Sangyo K. K. (Japan)) Japan. Pat. Sho 46-16475. 2p., June 6, 1971. (Appl. Jan. 31, 1968, claims not given).*

A combustion deodorizer effectively preheats odorous gas with heat produced by combustion. Thus, the 700-800 C combustion temperature necessary for gas deodorization is easily and economically attained. A blower is installed in the top corner of the device; its intake port is connected to the gas intake pipe and the discharge port is connected to the gas channel box housing several heat-exchange pipes. The interior of the device is horizontally divided into three sections. Vertical divisions partition the interior into two vertical compartments. The lowest horizontal compartment serves as the combustion chamber. The odorous gas in blown into the gas channel box. Then it flows through the heat-exchange pipes into the upper part of the right vertical compartment. Next, it passes through the middle and left vertical compartments into the lower part of the right vertical compartment, which is equipped with a burner. The preheated gas, with the high temperature fuel gas blows into the combustion chamber. Then the burned gas flows upward through spaces between the heat-exchange pipes, heating all the pipes. This effectively preheats the odorous gas before it is deodorized by burning. Finally, the deodorized gas leaves through a stack.

14262 APTIC NO. 32104

Oda, Takeshi

ON INCINERATION OF PLASTIC WASTES. *(Purasutikku haikibutsu no shokyaku shori ni tsuite). Text in Japanese. Nenryo Oyobi Nensyo (Fuel and Combustion), 38(7):35-44, July 1971.*

The incineration of plastic wastes causes the generation of poisonous gases, corrosion, the generation of black smoke, and the clogging of fire grates with molten plastics. The downdraft incineration burns plastic wastes, mostly vinyl chloride, in a precombustion chamber. Gas generated in the precombustion chamber flows downward through the fire grates to the main combustion chamber, where combustion with secondary air is completed. The gasification-recombustion furnace has several combustion compartments. Gas generated in the first chamber is led to the second, and then to the succeeding chambers to ensure perfect combustion furnace has no fire grates. Its side walls and semi-circular ceiling are of double-wall construction so that cooling water can flow through the space between the inner and outer walls to avoid corrosion. Combustion air is ejected into the combustion chambers of the furnace through a perforated air pipe. A plastics incinerator with a pretreatment device is also described. In this device, the air is completely shut off, and the plastic is carbonized at about 280 C. Gas generated by this dry distillation is mostly hydrogen chloride. The gas is absorbed in water to make hydrochloric acid which can then be neutralized for disposal, recovered as HCl, or reacted with ammonia to recover ammonium chloride for use as a fertilizer. The plastic residue is easily incinerated in the furnace.

14263 APTIC NO. 32507

Oehms, Klaus-Joachim

STATE OF THE ART AND CHANCES OF ELECTRIC CITY TRAFFIC. *(Stand der Entwicklung und Aussichten des elektrischen Strassenverkehrs). Text in German. Elektrizitaetswirtschaft, 70(17):511-517, 1971. (Presented at the VDEW, Jahrestagung, Mainz, West Germany, May 1971.)*

Direct current motors, thyristor control, lead-acid batteries, and battery replacement systems have been sufficiently tested in prototype electric vehicles. Test runs will soon be concluded and series production will begin. In an electric bus which is already in operation, the battery is carried along in a trailer. The battery must be changed after 50 km. The maximum speed of the bus is 60 km/hr, and the 360 V battery weighs 4000 kg. A small electric truck which was developed by Messerschmitt-Boelkow-Blohm has a maximum speed of 80 km/hr, accelerates to 50 km in 6.8 sec, and has a 144 V battery which weighs 870 kg. Arguments that the automobile emission problem is only shifted to power plants with the coming of the electric car are refuted. A truck with an Otto engine consumes 120 g gasoline/km while a comparable electric vehicle consumes 0.5 kWh/km; a passenger car with an Otto engine consumes about 80 g/km, the electric car about 0.25 Kwh/km. Only 55 g fuel oil need be burned to produce 0.25 kWh. The combustion process at power plants can be controlled.

14264 APTIC NO. 32109

Ogisu, Yoshihiro

COMBUSTION OF PULP WASTE LIQUOR. *(Parupu haieki no nensho). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 6(3):12-19, May 1971. 14 refs.*

General pulp waste liquor combustion methods are reviewed. Representative combustion processes designed to take care of Kraft pulp (KP), sulfurous acid pulp (SP), and semi-chemical pulp (SCP) waste liquors are examined. About 95-98% of the KP waste liquor is concentrated and burned in the recovery boiler to recover the chemical for reuse as the cooking liquor and reclaim heat from the vapor. The recovery boiler designed to dispose of the KP waste liquor for recovery of chemicals and heat developed about 35 years ago and widely used ever since, is briefly described. To eliminate the highly offensive odor from the exhaust gas it emits, the recovery boiler is often combined with a cyclone or venturi scrubber. Techniques for manufacturing alcohol, yeast and lignin from the SP waste liquor are not necessarily economically feasible. SP waste liquor is usually incinerated in a furnace equipped with the Loddby burner. The SP waste liquor containing 55% solids has a viscosity of about 60cp at 75 C and 20cp at 100 C, so that it is atomized for combustion. The solid content of the SP waste liquor has a calorific value of about 4500 kcal/kg, so that the SP waste liquor can be burned without auxiliary fuel. SCP waste liquor, similar in character to KP waste liquor, is concentrated and burned by means of the recovery boiler. The Scottish Pulp Co. of Britain is reportedly manufacturing SCP while recovering the chemicals by Stra-Process. The recovery boiler used in the process is a similar to that used for the KP waste liquor. The wet oxidation method, Copeland process and atomized suspension technique, designed for the combustion of SCP waste liquor, are also discussed.

14265 APTIC NO. 32191

Oldshue, James Y.

MIXING. *Ind. Eng. Chem., 59(11):58-70, Nov. 1967. 618 refs.*

Recent literature is reviewed and indicates that probing into the fluid dynamics of a mixing vessel continues, with three books now available on mixing technology. Gas-liquid contacting made up the largest numerical list of references on impeller mixers this year. Data on aeration and waste treating processes were very extensive, and significant new data were presented on the interstage mixing in continuous multistage equipment. Other studies this year have pertained to impeller flow and fluid dynamics, impeller power consumption, blending in single phase systems, solid-liquid mixing, liquid-liquid mixing, impeller gas-liquid mixing, heat transfer, foam condensation, gas-solid mixing, paste mixing, solid-solid mixing, vibrating, reciprocating, and pulsating mixers, fluid jets for mixing, mixing through flow distributors, fluidized beds, mixing in conduits, and mathematical descriptions of single stage and multistage mixing.

14266 APTIC NO. 32349

Orning, Arthur A.

PRINCIPLES OF COMBUSTION. *In: Principles and Practices of Incineration. Richard C. Corey (ed.), New York, Wiley- Interscience, 1969, Chapt. 2, p. 9-33. 11 refs.*

In the special application to incineration, combustion is a high-temperature process. Heat released by combustion is partly stored in the combustion products and partly transferred by conduction, convection, and radiation both to the incinerator walls and to the incoming fuel. Heat transfer to incoming fuel is needed for ignition. Some aspects of ignition are considered in relation to the management of air and fuel, others in relation to smoke and air pollution. Methods are presented for calculating the air required for complete combustion of a given fuel, the composition of the combustion products, and the temperature produced when a given portion of the heat released is held in the combustion products. Air pollutants from incineration that are not necessarily products of incomplete combustion, including particulate matter, sulfur oxides, and nitrogen oxides, are discussed.

14267 APTIC NO. 31891

Otake, Tsutao, Setsuji Tone, Yoshitsugu Yokota, and Kazuo Yoshimura

KINETICS OF SULFUR DIOXIDE OXIDATION OVER ACTIVATED CARBON. *J. Chem. Eng. Jap., 4(2):155-159, May 1971. 8 refs. (Presented at the Society of Chemical Engineers, 8th Meeting, Nagoya, Japan, Nov. 1969.)*

The rate of sulfur dioxide oxidation over activated carbon was measured in a gaseous stream of a sulfur dioxide-oxygen-nitrogen mixture. The rate was affected by catalyst fouling due to formation of sulfur trioxide on carbon. The rate-determining step appeared to be a surface reaction involving physically adsorbed SO2 and chemisorbed atomic oxygen. Rate data were analyzed according to the Langmuir-Hinshelwood model, and an overall-rate equation describing the surface reaction subject to catalyst fouling was derived. Experimental data were well correlated by the rate equation.

14268 APTIC NO. 32381

Otte, G.

A NEW ECONOMICAL WAY FOR SOLVING THE PROBLEM OF DUST COLLECTION: WITH THE KONTRELON-PROCESS. *Interceram (Luebeck), 18(3):219-220, 1969.*

The Kontrelon process permits the size and costs of a dust collection plant to be reduced by reducing the volume of waste gas to be treated to about half its initial volume. In the process, up to 50% of the total flow of gas is extracted in a purified state after discharge from the production plant and before entering the dust collection section. As a result, only 20 to a maximum 30% of the proportional part of the crude gas dust (less than three micron) remain in the extracted partial flow of gas. For many known dust sources this residual concentration lies below the specified dust discharge limit. Waste gas is first led to a cyclone-type concentration separator. After a suitable retention time, a partial flow of gas from which dust has been evacuated is extracted via a blower and led to the chimney. The partial flow of gas containing the concentrated dust is then lead to a suitable dust collection plant. In the case of a dust collection plant for a gas volume of 100,000 cu m/hr, the Kantrelon process would reduce capital costs by almost half.

14269 APTIC NO. 32318

Paulus, Harold J.

NUISANCE ABATEMENT BY COMBUSTION. *In: Air Pollution. Arthur C. Stern (ed.), Vol. 3, 2nd ed., New York, Academic Press, 1968, Chapt. 48, p. 521-534. 23 refs.*

The diversity of manufacturing operations which emit combustible contaminants and the need for corrective action has resulted in the use of three rapid oxidation methods: flares, furnaces, and catalytic combustion. Of the three combustion methods described, flares are most suitable to the destruction of off-gasses which are constantly released at concentrations above the flammable range, particularly where wide fluctuations in flow rate exist. Process exhaust gases containing combustible contaminants released at concentrations within or below the flammable range can, in most cases, be destroyed effectively by either furnace disposal or catalytic combustion. The choice will usually be based on comparative initial, operating, and service costs, and safety consideration, rather than on abatement efficiency. However, the potential field of application for catalysts to destroy combustibles in process exhaust gases continues to grow with the accumulation of operating records on installations now in daily use. (Author summary modified)

14270 APTIC NO. 32460

Petukhov, S. S., A. I. Tumanov, and G. A. Trokhina

A COMBINED PROCESS FOR THE REMOVAL OF IMPURITIES FROM AIR USING SYNTHETIC ZEOLITES. *Intern. Chem. Eng., 10(3):405-408, July 1970. 4 refs. (Also: Khim. Neft. Mashinostr., no. 1:12-14, 1970.)*

The use of zeolite in air purification units makes it possible to avoid the use of caustics for the removal of carbon dioxide, increases the operating conditions of the plant, and improves working conditions for personnel. Experiments were undertaken to determine the effect of air pressure, temperature, and humidity on the adsorptional capacity of the zeolite for CO2.

14271 APTIC NO. 31798

Rai, Charanjit, Sherman D. Collins, and Elmer J. Badin

SMOKE SUPPRESSANT FUEL MIXTURE. *(Cities Service Oil Co., Tulsa, Okla.) U. S. Pat. 3,577,228. 6p., May 4, 1971. 7 refs. (Appl. Jan. 3, 1969, 25 claims).*

The petroleum industry has encountered serious problems in supplying the demand for middle distillate and heavy residual fuel oils suitable for injecting into compression ignition engines, which will not contribute materially to the pollution of the atmosphere through soot and smoke production. It has been proposed to employ certain metallic smoke suppressants in fuels, particularly diesel fuel, to reduce smoke and soot production. However, a serious objection to these additives is that, owing to their limited solubility in fuels, certain laborious, costly, and undesirable procedures are generally required to form a homogeneous fuel mixture of these additives acceptable to the petroleum industry. A liquid fuel mixture is described which comprises a major portion of a hydrocarbon fuel and a minor portion of a Group II-A metal organyl orthophosphate. Preferably, a barium salt of a dialkyl orthophosphoric acid is employed in amounts from about 0.1 to two percent by weight. Further improvement results when an ether, particularly a glycol ether, is additionally incorporated into the orthophosphate and fuel mixture. (Author abstract modified)

14272 APTIC NO. 31811

Rasworschegg, Heinrich, Demeter Markow, and Alfr[illegible]odri

METHOD FOR THE UTILIZATION OF HOT WASTE GASES FROM FURNACES OF METALLURGICAL WORKS. *(Waagner-Biro A. G., Vienna (Austria)) U. S. Pat. 3,580,718. 6p., May 25, 1971. 5 refs. (Appl. Dec. 6, 1967, 11 claims).*

A two-step method is described for utilizing both the enthalpy and heat of combustion of hot waste gases from metallurgical furnaces, steel converters in particular. In the first step, the gases are cooled by passing them in indirect heat exchange relationship with water and air. The cooled gases are then burned in a combustion chamber with the preheated air and without any intermediate storing. In the combustion chamber, the products of combustion flow in indirect heat exchange relationship with the preheated water to generate steam. (Author abstract modified)

14273 APTIC NO. 3194

Reid, Laurance S.

DESULFURIZATION PROCESSES FOR NATURAL GAS LIQUIDS. *(Natural Gas Processors Assoc., Tulsa, Okla., Proc. Nat. Gas Process. Assoc., Ann. Conv., 49th, Denver, Colo., 1970, p. 104-108. 18 refs. (March 17-19.)*

Synthetic zeolites, called molecular sieves, are used for the selective removal of hydrogen sulfide and water from natural gas liquids by adsorption. Methyl and ethyl mercaptans are removed, too, if present. A weak castic soda solution can be used to contact the natural gas liquids and react hydrogen sulfide and carbon dioxide that may be present. Also, a solution of 10-15% caustic soda may be circulated in a regenerative system to dissolve and remove light mercaptans from natural gas liquids. Amines in water can be used to contact natural gas feed stock. Most solutizer processes can be considered as special versions of the regenerated caustic process where special solubility promoters are added to the caustic solution, making it possible to extract the higher molecular weight mercaptans. The Perco process converts mercaptans to disulfides by reaction with cupric chloride which, simultaneously, is regenerated by air. Other copper processes are cited. Catalytic conversion processes which are mentioned include the Merox process and the Bender process.

14274 APTIC NO. 32504

Ritzmann, H.

CYCLIC PHENOMENA IN ROTARY KILN SYSTEMS. *(Kreislaeufe in Drehofensystemen). Text in German. Zement-Kalk-Gips (Wiesbaden), 60(8):338-343, Aug. 1971. 7 refs.*

The temperature dependence of the reaction between sulfur dioxide and cement raw meal was studied. The adsorption line for the recirculating alkali, sulfur, and chlorine compounds was determined from the results of measurements obtained from Lepol and Dopol kilns. With the aid of the volatility of the raw meal, determined from small-scale tests, the volatility values for the recirculating compounds in Dopol kilns were calculated. Formulas for the content of sulfur, alkali, and chlorine in the clinker, in the raw gas, and in the dust are established. The effect of accumulations of alkalies, chlorine, and sulfur in cyclic patterns upon the flow capacity is demonstrated with reference to model tests with moistened raw meal. For the three component system comprising sodium sulfate, potassium sulfate, and calcium sulfate, the fusion temperatures are indicated. The effect of increasing sulfur content in the fuel upon the fusion temperature and the quantity of adsorbed phase is calculated in an example. (Author summary)

14275 APTIC NO. 32379

Rousseau, Robert

DEVICE FOR THE CONTROL OF AIR POLLUTION. *(Dispositif contre la pollution de l air). Text in French.*

(Assignee not given.) French Pat. 1,536,327. 1p., July 3, 1968. (Appl. July 3, 1967, 3 claims).

An ozone-generating device is described which, if connected to the air feed line of an internal combustion engine, turbine, or reactor, will assure almost complete oxidation of CO, soot, tar, and other products of incomplete oxidation which would otherwise pollute the environment. Ozone can, with the same effect, also be injected into the exhaust gas duct of internal combustion engines and into central heating furnaces or their flue ducts. The Berthelot apparatus is used to generate ozone; at ambient temperature this apparatus produces up to 10% ozone by electrical discharges between electrodes of a high voltage current which can easily be produced by the ignition system of an internal combustion engine. Any other ozone-producing system adaptable to these purposes can also be used.

14276 APTIC NO. 32440

Rueb, F.

TEXTILE FILTERS FOR STRINGENT REQUIREMENTS IN DUST EXTRACTION. *(Gewebeentstauber fuer anspruchsvolle Entstaubungsaufgaben). Text in German. Keram. Z., 23(6):324-329, 1971.*

In the ceramic industry, lung disease inducing dust is removed from the workshop atmosphere by fabric filters of the tubular or of the pocket type. Tubular filters can be of varied construction, they can be housed in cylinders, in chambers, or in housings of other shapes, and can be for either intermittent, or for continuous operation. A cylindrical tubular fabric filter for the purification of 17000 cu m/h air requires 26 6.3 m long tubes made of appropriate natural or artificial fiber fabric. While coarse dust particles fall off directly into the dust funnel, finer particles adhere to the inside of the tubes. The accumulated dust layers are loosened by injection of compressed air from the outside through the filter fabric. Under favorable circumstances, purified air can be returned to the work area. Pocket filters introduced after World War II require less space than tubular filters and more easily cleaned because the dust accumulates on the outside of filter pockets strung on removable supporting frames. In a pocket filter of simple construction, filter pocket units housed in a steel sheet housing are suspended from a vibrating rail which shake off accumulated layers of dust. Each unit consists of 13 filter pockets with a filtering surface of 14.5 sq m. These filters work with a 99.9% efficiency.

14277 APTIC NO. 31887

Saotome, Sadao

DESULFURIZATION OF STACK GAS BY GLIRO METHOD. *(Guriro ho ni yoru haien datsuryu). Text in Japanese. Netsu Kanri (Heat Management: Energy and Pollution Control), 23(7):29-34, July 1971.*

Although at one time it was considered that a dry method should be used to control large volumes of sulfur oxides, it is difficult to make dry method equipment which is compact; wet methods have an excellent absorbing capacity and need not be unwieldy in size. The Gliro method offers high absorbing capacity and rapid absorption speed, while being compact in size. The Gliro method uses a magnesium permanganate (Mg sub x MnO sub y) as an absorbent. In addition to a high absorbing capacity, it is easy to regenerate, while high concentrations of sulfuric acid are obtained as a by-product. Costs are low and 92% desulfurization can be obtained. The method is not influenced by the oxygen content of the combustion gases or combustion variables.

14278 APTIC NO. 31757

Scher, Jacoby A.

AIR POLLUTION CONTROL PROBLEMS IN THE SECONDARY METAL RECOVERY INDUSTRY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 25p., 1971. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-133.)*

The secondary metal recovery industry serves to remove from the environment one form of solid waste pollution and to recycle it into the economy. In accomplishing this task with various processing equipment, air pollution problems may develop which must be controlled by adopting suitable control systems. Case histories of four such processing systems, with descriptions of the air pollution problem created and the subsequent control equipment installed, are presented: a secondary lead smelter, drum reclamation, the dismantling of railroad cars, and wire reclamation. Recommendations for future air pollution control equipment which must be installed as control requirements are newly instituted or upgraded are also included. (Author abstract modified)

14279 APTIC NO. 32209

Schmidt, Josef, Heinrich Weber, Wilhelm Schmitz, and Rudolf Brosch

PROCESS FOR THE SEPARATION OF SULFUR OXIDES FROM GASEOUS MIXTURES. *(Procede d elimination des oxydes de soufre des melanges gazeux). Text in French. (Carl Still, Recklinghausen (West Germany)) French Pat. 1,508,644. 4p., Nov. 27, 1967. (Appl. Jan. 19, 1967, 2 claims).*

Oxides for sulfur in a concentration from one to 10 g/cu m can be separated from residual industrial gases without raising their dew point by treatment with dry metallic hydroxides which are converted to sulfites and sulfates. Granulated (diameter one to five mm) iron, aluminum, manganese, sodium potassium, calcium, and magnesium hydroxides are suitable. Lignite ashes, either by themselves or mixed with oxides of alkaline earth (50/50) to which water has been added, are especially suitable because they are inexpensive. The treatment is accomplished in towers where the gas passes through layers of the absorbent, or by blowing the absorbent into a stream of gas. The saturated absorbent in the latter case is removed in a cyclone. Regeneration can be accomplished by heat treatment or by expulsion of sulfur oxides by an inert gas life nitrogen or carbon dioxide at elevated temperatures, or, if sites are available, the absorption mass can be discarded because it is inexpensive. Optimal absorption temperature is 130-170 C, but the reaction is spontaneous even at O C.

14280 APTIC NO. 32431

Sefton, Verner Blakey

PROCESS FOR THE SEPARATION OF SULFUR DIOXIDE FROM WASTE GAS. *(Verfahren zum Entzug von Schwefeldioxid aus Abgasen). Text in German. (Ontario Research Foundation, Sheridan Park) West Ger. Pat. 1,919,813. 26p., April 18, 1969. (Appl. April 18, 1968, 2 claims).*

The method described converts sulfur dioxide from waste gas of power plant or ore-processing furnaces containing 0.1 to 0.5% SO2 to sulfur by mixing it with a reducing gas containing hydrogen sulfide, carbonyl sulfide, and/or carbon disulfide in the presence of a catalyst. The reducing gas is produced by catalytic combustion of sulfur, steam, and a hydrocarbon fuel (natural gas, residual oil) at 500 to 900 C. The waste gas to be purified, together with the necessary quantity of the reducing gas is passed in a continuous process through a catalytic bed (activated Al2O3) at 50 to 150 C where SO2 is reduced by an exothermic reaction to sulfur, which precipitates on the catalyst. The sulfur-saturated catalyst is replaced continuously by a catalyst regenerated at 300 to 400 C. The reducing gas, which is produced continuously at 500 to 900 C, is used to regenerate the saturated catalyst by volatilizing the sulfur. After condensation and removal of the volatilized sulfur, the reducing gas is mixed with the gas to be purified, passed through the catalytic bed where SO2 is reduced by H2S, and the cycle resumes. About two-thirds of the sulfur precipitated on the catalyst in the reactor is used to produce the reducing gas.

14281 APTIC NO. 32422

Shah, I. S.

THE REMOVAL AND RECOVERY OF SULFUR DIOXIDE AND ACID MIST FROM SULFURIC ACID PLANT STACK GAS USING VENTURI SCRUBBERS. *Preprint, American Inst. of Chemical Engineers, New York, and Inst. Mexicano de Ingenieros Quimicos, 20p., 1970. (Presented at the American Institute of Chemical Engineers and Istituto Mexicano de Ingenieros Quimicos Joint Meeting, 3rd, Denver, Colo., Aug. 1970.)*

The two main processes for the manufacture of sulfuric acid, the chamber process and the contact process, are reviewed for emissions and air pollution potential. Unreacted sulfur dioxide, unabsorbed sulfur trioxide, and sulfuric acid mist were the main atmospheric pollutants, within ranges of 1300-5400 ppm SO2 and 1-50 mg/SCF acid mist. The acid mist concentrations from acid concentrators ranged from 50 to 200 mg/SCF. A sulfur dioxide removal and recovery process is presented and the various systems comprising it are examined. The absorption centrifuge dryer, calciner, and the magnesium oxide systems are described. Outlet SO2 concentrations of 50-250 ppm were attained using the magnesium base SO2 removal and recovery process. Venturi scrubbers effectively removed sulfuric acid mist, SO2, and SO3 simultaneously. An acid mist loading of less than 5 mg/SCF was attained.

14282 APTIC NO. 32148

Sheppard, Stanton V.

PARTICULATE COLLECTION WITH PACKED CROSS-FLOW SCRUBBERS. *Preprint, American Inst. of Chemical Engineers, New York, 16p., 1970. 6 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 63rd, Chicago, Ill., Nov. 29-Dec. 3, 1970.)*

For air pollution control problems where only gaseous contaminants must be removed, the wet packed scrubber is usually the best choice. It is differential in nature, in that absorption efficiency is a function of packing depth. Normally a packed scrubber can be designed to give any desired collection efficiency. The Tellerette packed crossflow scrubber can serve in many industrial air pollution control applications as a primary scrubber and a tailgas unit. It can handle air streams containing fairly high solids loading with little or no downtime for packing cleanout. Operating costs are much lower than for integral scrubber designs formerly used. The scrubber must have high solids handling capability. Recycle scrubbing liquid requirements should be kept small. Flooding potential must be eliminated. Gas phase pressure drop must be kept low without sacrificing particulate collection capability. Gas to liquid mass flow ratios must be at correct levels for satisfactory mass transfer. Liquid distribution must be perfect to provide fully wetted packing without channelling. Packing support plate design should have low plugging or blinding potential. An entrainment separator must be provided to eliminate the carry over of any small liquid droplets from the liquid distribution system. Two basic types of packing used are extended surface packings and filamentous packings. Applications were discussed.

14283 APTIC NO. 32442

Shidara, Masao

TREND OF DEVELOPMENTS OF DESULFURIZATION EQUIPMENTS OF STACK GAS. *(Haien datsuryu sochi kaihatsu no tenbo). Text in Japanese. Netsu Kanri (Heat Management: Energy and Pollution Control), 23(7):1-4, July 1971. 4 refs.*

When fuel is burned, most of the sulfur it contains becomes sulfur dioxide, of which 1-5% is oxidized to sulfur trioxide. A thermal generating station requires 0.217 kl/MWh of heavy oil; the gas reaches up to 3000 N cu m. A thermal generating station with a capacity of 300 MW emits 900,000 cu m of smoke and consumes 65.1 kl/hr of heavy oil. Sulfur emission into the atmosphere was 1.85 kl/hr of heavy oil. Sulfur emission into the atmosphere was 1.85 t/hr, 47 t/day, and 15,700 t/yr. Total sulfur oxide emission last year was 6 million tons. In the United States, sulfur oxide emission in 1967, was 30 million tons, of which 46% was from thermal generation. Overall measures for air pollution control are discussed with respect to low sulfur fuel; development of desulfurization techniques; diffusion of smoke by constructing high stacks; adequate factory siting; and financial assistance for the installation of pollution controls. Desulfurization methods are not cheap and require complicated technology to install and operate. Many of the processes developed, theoretically simple and successful in the laboratory stage, were not practical because the volume of smoke was so great and the problem of the disposal of sulfur and effluent had not been solved. The wet and dry system (adsorption, absorption, contact oxidation, and reduction) are reviewed.

14284 APTIC NO. 31920

Shigaki, Masanobu

AUTOMATIC SCUM DISCHARGER TO BE INSTALLED BENEATH THE LAST STAGE COMBUSTION CHAMBER OF DUST INCINERATOR. *(Jinai shokyakuro no ushiro nensho sochi no shita nisonaeru jido sukamu haishutsu sochi). Text in Japanese. (Takuma Boiler Mfg. Co. (Japan)) Japan. Pat. Sho 44-25823. 2p., Oct. 30, 1969. (Appl. Aug. 22, 1966, 1 claim).*

A new device discharges ashes and scum from a dust incinerator through a chain conveyor while preventing the ashes from being scattered. Incinerator ashes are extinguished in a water tank behind the combustion chamber. Since the accumulation of scum on the surface of the tank water prevents the ashes from being extinguished, they are removed after lifting a single casing plate which separates the combustion chamber frame and water tank in the conventional incinerator. When the casing plate is lifted, however fresh air rushes into the tank space, causing an explosion or a cloud of ashes. The device has a chain conveyor with a number of short flight plates and a smaller number of tall flight plates. In operation, the short plates gather ashes and the tall ones gather scum. Also, a pair of casing plates are on both sides of th combustion chamber exit; one of the pair remains closed when the other is pushed open by the tall flight plate. This prevents fresh air from rushing into ashes, causing an explosion or a cloud of ashes. In a large-scale incinerator, the pair of casing plates at the entrance and exit of the conveyor are operated by power device.

14285 APTIC NO. 32357

Sinha, R. K. and P. L. Walker, Jr.

REMOVAL OF SO2 FROM FLUE GASES USING CALCINED ANTHRACITE AT ELEVATED TEMPERATURES. *Preprint, Pennsylvania State Univ., University Park, Dept. of Materials Science, 25p., 1970 (?). 10 refs.*

Interaction of a typical coal-fired power plant flue gas with calcined anthracite in a fluidized bed reactor was studied at temperatures between 700 900 C. Anthracite reacted with sulfur dioxide in the flue gas at 800 C to form elemental sulfur, a carbon-sulfur surface complex, hydrogen sulfide, and carbonyl sulfide. The amount of H2S formed was greater than the amount of COS for interaction with the wet flue gas. Oxygen containing gases, in addition to SO2, present in the flue gas also reacted with the anthracite, resulting in surface area development and activation. The period over which complete removal of SO2 from the flue gas was achieved was a function of temperature, residence time of the gases in the bed, and the extent of saturation of the anthracite surface with sulfur complexes. In theory, complete removal of SO2 can be continued indefinitely by charging fresh anthracite into the reactor bed at a rate at which it is removed from the bed by gasification. The partially reacted anthracite was catalytically active at about 150 C for the oxidation of H2S, formed as a reaction product, to elemental sulfur. The end products of the desulfurization of flue gases were elemental sulfur and active carbon. (Author abstract modified)

14286 APTIC NO. 32505

Sommers, Hans and Werner Last

REMOVAL OF ORGANIC SULFUR FROM COKE OVEN GAS. I. PURPOSE OF EXPERIMENTS, PROCEDURAL DESCRIPTION OF EXPERIMENTS. *(Entfernung von organischem Schwefel aus Koksofengas. I. Zweck der Versuch, Versuchsdurchfuehrung). Text in German. Erdoel Kohle (Hamburg), 24(7):473-477, July 1971. 9 refs.*

For the removal of organic sulfur compounds from coke oven gas, two processes are available. The first process decomposes the sulfur compound catalytically and thermally, while at the same time binding the decomposition products which were produced. The other process hydrates the organic sulfur compounds to hydrogen sulfide which is then chemically absorbed. The first method is not very efficient. Precious metal catalysts (platinum) or catalysts with cobalt, molybdenum, and/or nickel as active components are available for the hydration process. The reaction equations and equilibrium conditons which pertain to the second process are derived and discussed. Catalysts which bind sulfur in the form of sulfates and sulfides were tested experimentally. Activated charcoal was also tested.

14287 APTIC NO. 32392

Sorensen, Lee L. C. and Ken Nobe

THE EFFECT OF LEAD DEPOSITION ON THE OXIDATION ACTIVITY OF COPPER OXIDE-ALUMINA CATALYST. *Preprint, California Univ., Los Angeles, School of Engineering and Applied Science, 17p., 1971 (?). 11 refs.*

The effect of lead deposition on copper oxide-alumina catalysts in the catalytic oxidation of ethylene was investigated. The catalyst was prepared by impregnation of preformed alumina pellets with an aqueous solution of copper nitrate. Catalyst lead contents of approximately 5, 10, and 15% were obtained by further impregnation of the catalyst with an aqueous solution of lead nitrate with subsequent thermal decomposition. The catalytic activity was determined for ethylene concentrations of 300 to 1600 ppm in air, at a gas flow rate of 375 l/hr (25 C, 1 atm) at temperatures of 270 to 400 C. An atomic absorption spectrophotometer was used for analysis of the solutions. Pore volume of the catalysts was determined by displacement of isopropyl and mercury, respectively. Surface areas were determined by nitrogen adsorption at liquid nitrogen temperatures. The catalyst activity was severely reduced by the lead deposits. (Author abstract modified)

14288 APTIC NO. 31770

Spencer, Robert W. and Robert S. L. Andrews

FUME CONTROL METHOD AND APPARATUS. *(Inductotherm Corp., Rancocas, N. J.) U. S. Pat. 3,576,318. 5p., April 27, 1971. 3 refs. (Appl. April 4, 1969, 8 claims).*

A method and apparatus are presented for controlling fumes generated in an arc furnace. The fumes are collected by a circumferentially disposed duct with a cross-sectional area which increases in the direction of flow. Fumes are introduced into the duct by ports or spaces in the roof of the furnace, with the flow passage formed by the spaces or ports in the roof decreasing at the same rate as the duct cross-sectional area increases. Previous apparatus had utilized telescoping or moving joints which presented maintenance problems under high temperature conditions. Also, when a water-cooled elbow was used, the necessary large diameter hole in the roof structure weakened it and shortened its useful life. (Author abstract modified)

14289 APTIC NO. 32312

Stafford, Ronald G. and Harry J. Ettinger

FILTER EFFICIENCY VS PARTICLE SIZE AND VELOCITY. *Los Alamos Scientific Lab. N. Mex., Atomic Energy Commission Contract W-7405-eng-36, Rept. TID-4500, UC-41, 7p., April 1971. 20 refs. 0NTIS: LA-4650*

Several commercial filter media were evaluated for efficiency as a function of particle size and velocity. Particle size and velocity producing minimum efficiency were different for each media and were well below single fiber theoretical predictions. Experimental efficiencies were generally higher than theoretical mat efficiencies. The Whatman 41 filter media exhibited minimum experimental efficiency with a particle size between 0.234 and 0.312 micron. Filter efficiency increased as the filter became more loaded at low velocities (20 ft/min); however, at velocities above 100 ft/min, efficiency initially increased and then decreased with continued loading. Efficiency of the IPC 1478 filter media decreased as particle size decreased down to 0.176 micron for velocities above 15 ft/min. Below this velocity, minimum efficiency occurred with a particle size of approximately 0.5 micron. (Author summary modified)

14290 APTIC NO. 32014

Stamulis, Aristides, Joseph K. Thompson, and Harold F. Bogardus

THE CO2 PULSE TECHNIQUE FOR DETERMINING THE CONDITION OF ABSORBENT CHARCOAL BEDS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1971. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-26.)*

The carbon dioxide pulse technique is a non-destructive method by which one can determine the remaining capacity, or the residual life of a charcoal bed before it becomes exhausted. A dose of CO2 is injected into the air stream ahead of the charcoal bed and is eluted through the bed. The shape of the emerging CO2 elution peak is determined by the condition of the charcoal bed. For a new, unused bed the peak is considerably dispersed (flattened and broadened) due to adsorption and desorption at the charcoal surface. For a partially spend bed, it is dispersed to a degree proportional to the remaining capacity of the bed; it is not affected by passage through a fully spent bed. The CO2 pulse technique indicates charcoal capacity for a wide range of non-polar materials (hydrocarbon, alcohols), which are taken up primarily by physical adsorption. The method is essentially insensitive to relative humidity in the range between 10 and 70%. An adaption of the method was used for detection of leaks in a charcoal bed, such as those caused by channeling and faulty packing. (Author abstract modified)

14291 APTIC NO. 32473

Stern, Arthur C.

PRINCIPLES OF SEPARATION AND COLLECTION. *Preprint, American Foundrymen s Society, Des Plaines, Ill., 5p., 1970. 2 refs. (Presented at the Total Environmental Control Conference, Ann Arbor, Mich., Nov. 16-19, 1970.)*

Collector selection in a foundry involves choosing from among all the collectors which will meet the technical requirements and choosing among these to find the least expensive. Filters operate by particle removal direct interception, impaction, diffusion, and electrostatic attraction. Electrical precipitators have one or more high intensity electrical fields to cause particles to acquire an electrical charge and to be forced to a collecting surface. Cyclones, mechanical collectors using gravity or centrifugal force, and scrubbers are also discussed. Adsorbers are devices in which the contaminant gases or vapors are retained on the surface of the porous media through which the carrier gas flows.

14292 APTIC NO. 32113

Tajiri, Teruhide

STUDIES ON THE WET SUPPRESSION OF DUST. *(Shisshiki funjin yokusei). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 6(3):43-50, May 1971. 15 refs.*

Experimental studies were made to analyze factors affecting the efficiency of wet dust suppression. For suspended dust, the correlation among the density of suspended dust, the density and size of the water droplets, and the kinetic energy of the water droplets greatly influenced the efficiency. Water droplets ranging from 80 to 200 micron in size gave the highest suppression effect for suspended dust. When the sprayed water droplet is either too large or too small, the suppression effect decreases. A pressure water spray nozzle is generally effective in making water droplets finer but results in a smaller travel distance of the water droplet, thus decreasing contact efficiency of the water droplet. Generally, the larger the horizontal travel distance, the higher the suppression effect. With the same type of spray nozzle, the suppression effect is higher in proportion to a greater water consumption. Water should be sprayed at such an angle or direction that the source of dust generation is covered entirely with atomized water. Of about 40 types of nozzles investigated, the compressed air-water type was most effective for dust suppression. Most spray nozzles in use today are not recommended. Based on another experiment, dispersion or scattering of deposited dust can be suppressed remarkably well by wetting the dust for a five to seven percent water content.

14293 APTIC NO. 31947

Takagi, Keizo, Kazuo Inushima, and Katsuhiko Nakano

STUDY ON DISPOSAL OF WASTE WATER FROM DUST COLLECTION PROCESS. *(Shujin haisui shori ni kansuru kenkyu). Text in Japanese. Kankyo Gijutsu Kenkyusho Hokoku (Bull. Ind. Environ. Control Res. Lab.), 6(1):47-54, Aug. 1970.*

Laboratory and pilot plant studies were conducted to find an effective method for disposing of effluents from scrubbers and similar wet dust collectors. The effluents considered were mainly those from blast furnace, calcium silicate and sintering dust collectors. The chemical compositon of the waste water is shown. The laboratory study involved the beaker test using a jar tester. The pilot plant process was similar to the high-speed flocculation/sedimentation process, except that the stirring/flocculating section of the latter was replaced with a granular layer through which the waste liquid was forced. Specifications for this contact flocculation system were as follows: raw water treatment capacity, two cu m/hr; retention time in the flocculation tank, 10 min; retention time in the sedimentation tank, 90 min; flocculant grain size, 10-15 mm; thickness of the flocculant layer, two m. Up to 100 ppm aluminum sulfate and up to 0.5 ppm Koonan Floc No. 3000 were injected in 17 pilot plant experiments. Seven other experiments involved only pH control with caustic soda. The results show that contact flocculation can be applied in disposing of dust collector waste water. Since blast furnace gas contains a large amount of unstable, dissolved gas, it is better to employ an aeration system for getting rid of the dissolved gas. The temperature of the waste water is so high that concentration differences cause water in the sedimentation tank to flow violently, thus obstructing sedimentation. Therefore, raw water cooling and adequate solid/liquid separation should be considered. The flocculant may be aluminum sulfate, preferably combined with a polymer flocculant such as a nonionic acryl. Sludge produced amounts to about two percent of the quantity of wastewater treated, and since it is readily dehydrated, it can be concentrated to 94% water content in 30 min.

14294 APTIC NO. 31903

Tanaka, Masanao, Takao Okahashi, and Masakatsu Imazu

MANUFACTURING OF DESULFURIZING AGENT CHIEFLY COMPOSED OF CARBON, A BYPRODUCT. *(Fukusei Kabon o shutoshita datsuryuzai no seiho). Text in Japanese. (Seitetsu Kagaku Kogyo K. K. (Japan)) Japan. Pat. Sho 46-17761. 3p., May 18, 1971. 2 refs. (Appl. Feb. 1, 1968, 2 claims).*

An effective way to utilize the carbon from byproducts of manufacturing processes is discussed. The carbon can be manufactured without going through the dehydration process. The moist carbon is mixed with a sodium silicate water solution and cement plus any other desulfurization promoter when necessary. The mixture is molded and dried under reduced pressure to make the desulfurizing agent chiefly composed of the carbon. The additives are the 30-50% sodium silicate water solution and Portland cement or Portland blast furnace cement, both amounting to 0.05-0.2 times in terms of 40% water solution. Sawdust, bentonite, Chinese yellow and sulfuric acid dreg may also be added to promote adsorptivity of the desulfurizing agent. The mixture is molded by an injection molding machine under reduced pressure of 200 mm Hg or lower. The moldings so obtained are dried under reduced or atmospheric pressure at 100 C, preferably at room temperature to 80 C.

14295 APTIC NO. 31938

Taniguchi, Hatsuhiko and Mikio Mizuno

EXHAUST GAS CLEANING DEVICE. *(Haiki shori sochi). Text in Japanese. (Nippon Sharyo Seizo K. K. (Japan)) Japan. Pat. Sho 46-16169. 2p., June 5, 1971. 1 ref. (Appl. Feb. 9, 1967, claims not given).*

An exhaust gas cleaner is described which can be used for internal combustion engines such as diesel locomotive engines used in tunnel construction. The cleaner comes in a tubular casing placed in a horizontal position. The conical casing has a discharge port. The adsorbent holder consists of two wire-net cylinders tapering toward the discharge port. Since the inner cyclinder tapers less than the outer cylinder, the spacing between them increases as they approach the discharge port. The tapered end is completely closed by an end plate, while the intake side is fitted to a ring-like cover attached to the flanged end of the tubular casing. A conical coupler is connected to the cover, and the engine exhaust pipe is connected to the other end of the coupler. Inside the inner wire-net cylinder, a pressure air nozzle connects to an air pipe inserted from the outside through the conical coupler. It can be connected to an air compressor when necessary. Exhaust gas, introduced inside the inner cylinder, flows through the catalyst or chemical adsorbent material in the adsorbent holder and is reduced to harmless carbonic acid gas. The filtered gas is then discharged. When the holder becomes dirty or clogged with soot or dust, pressurized air is injected through the nozzle to blow off the soot or dust and clean the wire net. With occasional cleaning, the adsorbent material withstands up to 2000 hours of use. Replacement of adsorbent material is simple.

14296 APTIC NO. 31948

Taniyama, Mitsumasa and Shingo Matsumoto

ON NEUTRALIZATION TREATMENT OF EFFLUENTS FROM ASBESTOS CEMENT PIPE MANUFACTURING PLANT BY STACK GAS. *(Ishiwata paipu kojo haisui no endo gasu ni yoru chuwashori ni tsuite). Text in Japanese. Kankyo Gijutsu Kenkyusho Hokoku (Bull. Ind. Environ. Control Res. Lab., 6(1):55-59, Aug. 1970.*

When stack gas is inducted into alkaline waste water (pH 12), a white sediment forms and the pH decreases rapidly to seven or eight. It then drops very slowly as the white sediment starts to dissolve, reaching six by the time the sediment is completely dissolved. The white sediment is a product of the neutralization. If waste water is treated by stack gas until the white sediment is completely dissolved, disposal of the sediment is not a problem. But the total quantity of gas required to cause the dissolution is too large, compared with that required for neutralization. In the experiment described, waste water from an asbestos cement pipe manufacturing company was contacted with stack gas by an ejector device. Ways of sedimenting and separating the neutralization product were studied. The ability of the product to settle was greatly affected by pH, separation by sedimentation was very difficult, if not impossible, at a pH of 7.5 or lower. Properties of the raw water and water treated at a pH of eight and sedimented for two hours were as follows: pH, 12.0 for the raw water and 8.0 for the treated water; suspended solids (ppm), 23.0 and 35.0; electroconductivity in microohms, 10,800 and 8000; calcium (ppm), 1040 and 550; p-alkaline calcium carbonate, 9.0 ppm, 1324 and 0. The relationship between the gas/liquor ratio (quantity of gas inducted (l/min)/quantity of treated water (in l) and the time required unit neutralization was studied to determine the degree of water-gas contact and capacity of the water retainer tank at the required pH value. The plant discharged about 1000 cu m of waste water a day. At a gas/liquor ratio of 1.5 and a treated water pH of 8.25-7.50, the total quantity of gas required until neutralization was 3500-4000 cm, amounting to about 2.5-2.9% of the total stack gas from the plant. For treatment until the sediment dissolved, 12.5 times as much gas was required. However, the sediment must separate, if treated only until neutralization. Optimum pH for sedimentation is generally 8.00 to 9.25.

14297 APTIC NO. 32157

Thau, A.

REMOVAL OF SULPHUR FROM INDUSTRIAL GASES.

(Schwefel in Inaustrie- gasen und seine Entfernung). Text in German. Brennstoff Chem. (Essen), 40(13-14):208-220, April 1944. 66 refs.

The most frequently used desulfurization methods for industrial gases can be divided into wet and dry processes. The wet processes include oxidation and neutralization. The oxidation processes are mostly based on the simultaneous binding of gaseous sulfur and ammonia in the production of ammonium sulfate. One neutralization process is gas scrubbing with ammonium water. Iron hydroxide is used for the dry desulfurization of coke oven and synthesis gas. However, the capital costs involved in this method are too high, so it is not used for cleaning generator gases. In coal coking, pulverized lime is added (1.5 to 2% to the coal) to bind the sulfur and coal. Soft coal, used as generator fuel, contains 0.25 to 7.50% sulfur and hard coal 0.25 to 6.50% sulfur. In generator gas, the sulfur is present only as hydrogen sulfide. The Raffloer process injects iron hydroxide counter to the gas flow. In another version, grains with 15 to 20 mm diameters are used instead of irregularly sized grains. The Seabord process uses a 2% sodium solution for gas scrubbing. In the Thylox process, the gas is scrubbed with analkaline arsenic solution. The Girdler method uses di-and triethanolamine for gas scrubbing. Amino-acid salt solutions are used as scrubbing fluids in the Alkazid method. Desulfurization can also occur by the adsorption method.

14298 APTIC NO. 31969

Uhle, Hans

MECHANICAL FILTERS.

(Schwebstoffilter in der Feinwerktechnik). Text in German. Feinwerktechnik, 75(3):133-134, March 1971.

Clean rooms and clean work sites for fine mechanical assembly work require the installation of high efficiency particulate air aerosol filters. Guidelines of the Dust Research Institute in Bonn stipulate criteria which such filters, designed to separate radioactive dust, fog, bacteria, and viruses, must meet. These filters are used in the manufacture of electronic equipment, microrelays, miniature ball bearings, precision instruments, dental tools, and injection needles. Several folds of glass fiber fleece are encased in filter cell frames by a liquid plastic adhesive. Filters must be replaced when air flow velocity drops below a minimum and when the installation of preliminary filters does not result in an increase in air flow velocity. When the static pressure loss of filters can no longer be overcome by ventilators and when filters develop leaks which cause abnormal permanent particle concentrations, they must be replaced. Replacement of the aerosol filters must be accomplished in a leakproof fashion. When highest demands are placed on air purity, ultra high efficiency aerosol filters must be used which will separate all but one particle of 100,000 particles with 0.3 micron diameters.

14299 APTIC NO. 31819

Venturini, Peter D.

THE AIRR CAR – A LOW EMISSIONS VEHICLE.

California Univ., Berkeley, Thermal Systems Div., NAPCA Grant AP-385-05, 21p., Aug. 1970. 14 refs.

A low emissions vehicles was designed and built. Reduction of air pollutants in the exhaust was accomplished by external modifications to the vehicle s engine. These modifications consist of two exhaust manifold reactors, a platinum-type catalytic muffler, synchronized air injection, exhaust gas recirculation, and unleaded fuel. The vehicle modified was a 1970 Plymouth Belvedere four door sedan. Preliminary testing indicated compliance with 1975 proposed Federal emission standards. The total cost was $728.47 for the control equipment which reduced hydrocarbons, carbon monoxide and nitrogen oxides from the exhaust, crankcase, and fuel system.

14300 APTIC NO. 31825

Venturini, Peter D.

THE AIRR CAR – A LOW EMISSION VEHICLE. PART II.

California Univ., Berkeley, Thermal Systems Div., NAPCA Grant AP-385-05, 52p., Nov. 1970. 9 refs.

A low emissions vehicle was built and entered in the 1970 Cross Country Clean Air Car Race. Modifications to the 1970 Plymouth Belvedere included two exhaust manifold thermal reactors, synchronized air injection, exhaust gas recirculation, a platinum type catalytic muffler, and unleaded gasoline. The vehicle finished fourth in class and exhibited exhaust emissions of hydrocarbons, carbon monoxide, and nitrogen oxides 50% below the 1975 proposed Federal standards during cold start open seven mode testing. A lack of sufficient development time resulted in some problems with the vehicle; however, its overall performance demonstrated the feasibility of its emissions control system as a viable solution to the automotive pollution problem. (Author abstract modified)

14301 APTIC NO. 31893

Wakabayashi, Katsuhiko, Hiromitsu Abe, and Yoshio Orito

HYDRODESULFURIZATION OF THIOPHENE.

(Arumina tanji shokubai niyoru chiofen no suisoka datsuryu). Text in Japanese. Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), 74(7):1317-1319, July 1971. 14 refs.

The variation of catalytic activity with the addition of metal was investigated. One-component (alumina) and two-component (molybdenum-alumina) catalysts were studied. The ordinary fixed bed reactor had a pyrex reaction tube heated by an electric furnace. Sample gas composition was six percent thiophene, three percent benzene, and 91% hydrogen. Total flow rate was 2.0 ml/sec. Reaction temperature and contact time were 350 C and 250 C 5.0 sec (g-cat/ml) and 300 C and 2.5 sec (g-cat/ml) for one-component and two-component catalysts, respectively. Butane, 1-butene, c-2-butene, and t-2-butene were main products. One-component catalysts can be classified into four groups according to the reaction percentage of thiophene: (A) 84%, platinum; (B) 20-40%, palladium; 41%, M; 39%, rubidium; 33%, chromium; 31%, cobalt; and 19% nickel; (C) 9%, copper and vanadium; 7%, silver; and 3%, iron; (D) zero percent, magnesium, calcium, zinc, aluminum, titantium, lead, tin, bismuth, manganese, and strontium. All metals showing catalytic activity belonged to the transition group. Metals of group VIII were especially active, and there was a tendency for activity to increase with atomic number. This implies the participation of d electrons and atomic radius in hydrodesulfurization. Two-component catalysts with added Ni or C0 became very active (thiophene reaction percentage 63% and 51%, respectively. Molybdenum increased the percentage only 15%. The two-component group showed low butane selectivity and, therefore, low consumption of hydrogen. Other metals had little (10-20%) or negative (-10%) additional effect on catalytic activity.

14302 APTIC NO. 31951

Wakabayashi, Katsuhiko, Takashi Saito, Hideo Saeki, and Yoshio Orito

HYDROGENATION OF METHYL MERCAPTAN AND THIOPHENE OVER COBALT-MOLYBDENUM-ALUMINA CATALYSTS. *(Kobaruto-moribuden-arumina kei shokubai niyoru mechiru merukabutan oyobi chiofen no suisoka hanno). Text in Japanese. Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), 74(7):1313-1316, July 1971. 11 refs.*

Catalysts effective in hydrodesulfurization are multi-component systems. Methyl mercaptan and thiophene were hydrogenated over cobalt-molybdenum-alumina (Co-Mo-A1203) catalysts in the vapor phase under ordinary pressure, and the relationship between the Co-Mo composition and the activity of the catalysts was investigated. The catalysts were prepared by the impregnation method, and the catalytic metals were contained in 0.1 gram-atom in 100 g of activated alumina. Tubular fixed-bed flow reactors were used, and the determination was made by gas chromatography. In the presence of hydrogen and the catalysts, methyl mercaptan underwent disproportionation to methyl sulfide and hydrogen sulfide and hydrogenolysis to methane and hydrogen sulfide at 200-260 C, much more methyl sulfide was produced than methane. When the atomic ratio of Co to Mo in the catalyst was one to three, the yield of methane reached its maximum, while that of methyl sulfide was at its minimum. The yields of the two products changed with the Co-Mo composition, and an increase in one product was usually accompanied by a decrease in the other. Consequently, the total reaction percentage was almost constant and independent of the Co-Mo composition. The principal products in the hydrogenation of thiophene were butane, 1-butene, c-2-butene, t-2-butene, and hydrogen sulfide. The proportions of the three butenes were unchanged with the Co-Mo composition, apparently because of sufficiently rapid isomerization. The most active catalysts were of Co/Mo equals two to three and one to one decomposition. Their reaction percentage was about four and six times as large as that with the catalysts of molybdenum only and of cobalt only, respectively, at 300 C.

14303 APTIC NO. 32481

Wakabayashi, Katsuhiko and Yoshio Orito

RELATION BETWEEN PRETREATING CONDITIONS OF THE HYDRODESULFURIZATION CATALYST AND CATALYTIC ACTIVITY. *(Suisoka datsuryu shokubai no kassei no mae shori joken niyoru henka). Text in Japanese. Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), 74(7):1320-1323, July 1971. 6 refs.*

Methyl mercaptan and thiophene were hydrogenated in the gaseous phase at atmospheric pressure over nine varieties of catalysts prepared under varying pretreating conditions of burning and presulfurizing temperatures, sulfurizing reagent used, and concentration in sulfurizing gas. Impregnated catalysts of cobalt-molybdenum-aluminum oxide were used. A water solution of cobalt nitrate and ammonium molybdate (Co:Mo equals 1:2) was added to activated alumina of 16-20 mesh. After drying it was burned in an air stream for two hours at varying temperatures and in a gas containing hydrogen sulfide in various volume percentages. The reaction percentage of thiophene and the yield of methane from methyl mercaptan decreased with burning temperature and increased with sulfurizing temperature and H2S concentration (sulfurized percentage). The catalysts presulfurized by methyl mercaptan and thiophene were less active than those presulfurized by H2S. When the catalysts were presulfurized by H2S the pretreating conditions did not affect the selectivity of butane produced from thiophene. The minimum yield of methyl sulfide produced in the disproportionation of methyl mercaptan was at 66% sulfurization.

14304 APTIC NO. 31912

Wakaumi, Hiroshi

AIR CLEANER. *(Ea kurina). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 46-22601. 2p., June 28, 1971. (Appl. Feb. 28, 1967, claims not given).*

An air cleaner packed with bulky synthetic fiber materials removes dust from air by electrostatic attraction of frictional electricity. A number of air intake holes are provided in the casing, while an air discharge port is provided at the bottom center of the casing. A number of small vertical rods are erected in the interior of the casing. The rods are made of a material such as ebonite, likely to produce static electricity by friction with synthetic fibers. The air cleaner is packed with synthetic fibers treated with a bulking process. When the air cleaner vibrates due to vibration of the engine or machine to which it is attached, the synthetic fibers rub against the vertical rods. This generates frictional electricity and the fibers become charged with electricity. Therefore, dust in air is more effectively adsorbed by the fiber material.

14305 APTIC NO. 32455

Walker, A. B.

EFFECTS OF DESULPHURIZATION DRY ADDITIVES ON THE DESIGN OF COAL-FIRED BOILER PARTICULATE EMISSION CONTROL SYSTEMS. *Can. Mining Met. Bull. (Montreal). 64(713):85-90, Sept. 1971. 11 refs. (Presented at the Canadian Institute of Mining and Metallurgy, Annual General Meeting, 73rd, Quebec City, Quebec, April 1971.)*

The effects of the injection of dry limestone additives into boilers for the sorption of sulfur dioxide were studied in pilot and full-scale systems. Implications of the effects on the design and economics of particulate collectors, in particular electrostatic precipitators, are discussed. The injection of calcium or magnesium-base additives into boilers for flue gas desulfurization will have a significant effect on the economics of the collection of fly ash and reaction products. The effects can be minimized if precipitators are either modified or initially installed to operate at temperatures in excess of 600 F. (Author abstract modified)

14306 APTIC NO. 31997

Walsh, W. H. and J. A. Waddell

OBTAINING AND MAINTAINING LOW EXCESS AIR OPERATION ON AN INDUSTRIAL BOILER. *Preprint, Illinois Inst. of Tech., Chicago, Technical Center, 8p., 1971. (Presented at the American Power Conference, Annual Meeting, 33rd, Chicago, Ill., April 20-22, 1971.)*

The problem of the fouling of the regenerative air heater surface of a steam generator due to acid condensed on the air heater surfaces is examined. More accurate use of the air warmer and conversion to low excess air firing in order to minimize the formation of sulfur trioxide are discussed as solutions. Satisfactory combustion conditions were established when carrying 15% excess air; with 10% excess air, operation became unsatisfactory. To improve operation with 5% excess air, mechanical analyses were made of control system tuning, air quantity in the burners, spray angles for the steam atomizing burner nozzles, and steam atomizing oil guns. Air preheater plugging was examined by use of a sulfur oxide analyzer and an acid deposition rate probe. No stack emissions were observed when the unit was operating at 265,000 lbs of steam per hour, or 88% of maximum continuous rating, with 3% excess air (0.6% oxygen), 3.1% sulfur oil, and an ambient temperature of 26 F.

14307 APTIC NO. 32093

Watkins, C. H. and C. J. Czajkowski

DESULFURIZATION PROCESSES: HYDRODESULFURIZATION OF GAS OILS. *Chem. Eng. Progr., 67(8):75-80, Aug. 1971.*

Typical feed and product properties and operating data are reported for two commercial gas oil desulfurization units, one the Far East and the other in the Western Hemisphere. The Far East unit, in Japan, is designed to produce light gas oil containing 0.1 wt% sulfur and vaccum gas oil containing 0.18 wt% sulfur from a blend of 3000 bbl/stream day of light gas oil containing 0.8 wt% sulfur and 10,000 bbl/stream day of vacuum gas oil containing 1.8 wt% sulfur. Although the unit has been operated at a level of 80% desulfurization, design sulfur removal is about 90%. The Western Hemisphere unit is designed for 90% desulfurization of a 1.6 wt% sulfur, 630-1050 F blend of light and vacuum gas oils from several crude oils. The weekly average charge rate is slightly above the 30,000 bbl/stream day design charge rate. Desulfurization has been satisfactory even when the total sulfur content of some mixtures approached 2.0 wt%. With crudes containing 1.46 wet% sulfur, 95% desulfurization has been achieved. For both units, catalyst lives in excess of five years are estimated. Total desulfurization costs are above 150/bbl plus the cost of hydrogen. Sulfur levels in various fractions of the products vary from 0.05-0.25 wt%. Knowledge of sulfur distribution is useful for blending purposes when formulating fuel oils.

14308 APTIC NO. 32472

Wessel, J. and U. Schmidt

TESTS MADE WITH MULTI-STAGE CHANNEL-TYPE IMPELLER SEPARATORS. *(Untersuchungen and mehrstufigen Kanalrad-Sichtern). Text in German. Aufbereitungs-Technik., 12(7):July 1971. 10 refs.*

Through suitable arrangement of the stages in a multi-stage channel-type impeller, a high separation efficiency can be accomplished with small load air streams. The results obtained for one and three-channel impellers for circumferential speeds ranging from 15-16 m/sec have given optimum d-sub 25/d-sub 75 values of greater than 0.8. The interrelation between the cut point and the circumferential speed can be rather accurately approximated by an equation which is presented.

14309 APTIC NO. 31771

Wilson, Raymond F., Reese A. Peck, and Frank E. Guptill, Jr.

HYDROGEN RECOVERY PROCESS. *(Texaco, Inc., New York, N. Y.) U. S. Pat. 3,575,690. 4p., April 20, 1971. 3 refs. (Appl, March 28, 1969, 13 claims).*

A process is described for recovering hydrogen by introducing an aromatic hydrocarbon and the hydrogen-containing refinery gas at elevated temperatures and pressures to a reactor containing a hydrogenation catalyst. The gases are introduced countercurrent to the catalyst. Effluent from the first zone is introduced into a second zone in the same manner, and a hydrogen-containing gas comprising over 90 vol% hydrogen is recovered. The process can be carried out with the elimination of gas-liquid separation steps which follow the hydrogenation and dehydrogenation steps of the prior methods.

14310 APTIC NO. 31804

Yagi, Shizuo and Urataro Asaka

EXHAUST GAS PURIFICATION DEVICE FOR A 4-CYCLE ENGINE. *(4-saiury enjin no haiki joka sochi). Text in Japanese. (Hondo Giken K. K. (Japan)) Japan. Pat. Sho 46-16166. 2p., June 5, 1971. 1 ref. (Appl. Nov. 9, 1966, claims not given).*

Afterburning of exhaust gas from a four-cycle engine is improved by locating an air injection hole in the side wall of the cylinder at a point immediately above that where the piston completes its return stroke. The hole is linked to a high-pressure air source by a pipe equipped with a reverse flow stopper valve. When the piston moves upward during the exhaust stroke, air injected through the hole mixes with the exhaust gas to bring about its efficient recombustion. The gas is then at a high temperature and assured of adequate reaction time. The air injection device works efficiently even with comparatively low-pressure air. Air is injected to the cylinder between the final stage of the intake stroke and the initial stage of the compression stroke which causes no trouble.

14311 APTIC NO. 32094

Yamada, Suzumu

EXHAUST GAS CLEANER DEVICE FOR INTERNAL COMBUSTION ENGINE. *(Nainenkikan yo haiki kurina sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 46-22965. 3p., June 30, 1971. 4 refs. (Appl. Sept. 2, 1967, 1 claim).*

A catalytic device is described for removing the pollutants from an internal combustion engine exhaust. It uses an emulsion of soapy water and sodium hydrocarbonate or sodium carbonate. A container for the emulsion is inside and on the bottom of the device, and the top of the container has with several holes for the escape of the emulsion vapors. Two cylinders, installed in a horizontal position above the emulsion container, are held in place by vertical rods erected on the container. One end of a cylinder is closed, but a hole is provided in the top side near the closed end; the open end of the second cylinder is covered with a filter screen coated with catalyst. The short pipe, which serves as a discharge port, is equipped with filters at both ends. Below the discharge port is an enclosed compartment filled with activated carbon. The exhaust gas flows in two directions, upward and downward, because the intake port is covered with a tubular apparatus with two openings. Heavier exhaust gas flows into the area packed with catalyst immediately above the emulsion container, while the lighter gases flow into the cylinders located in the upper portion of the cleaning device. When contacted with the filter of the cylinder, harmful gases are reduced to carbonic acid gas. Meanwhile, the heavier gases which contain more tar flow toward the discharge port through the catalyst; due to the high temperature of the exhaust gas, the emulsion evaporates and diffuses into the catalysts, so that the tar and carbon dust may be effectively controlled. Activated carbon near the discharge port easily deodorizes the gases which are now lighter, and the exhaust gas is further filtered by the filters of the discharge port.

14312 APTIC NO. 31889

Yamaguchi, Fumihiko

DESULFURIZATION OF STACK GAS BY TCA METHOD. *(TCA ho ni yoru haien datsuryu). Text in Japanese. Netsu Kanri (Heat Management: Energy and Pollution Control), 23(7):12-20, July 1971.*

Turbulent Contact Absorber (TCA) equipment has been popular for its performance, easy handling, and no need for maintenance. The equipment comprises two grids in the lower and upper part of a tower and, in between the grids, a small quantity of light, plastic balls which are filled and act as a catalyst between the gas and liquid. By allowing the gas and liquid to flow at high speed, the balls are given a turbulent motion, so that the gas and liquid are brought into intimate contact. There is no clogging of the equipment due to dust, while a considerable volume of gas can be handled with stable operation even if there is a change in gas volume. TCA equipment has been used for processing sulfur dioxide, chlorine, hydrogen fluoride, hydrogen sulfide, and other sulfur-containing gases. Alkaline calcium salt compounds may be used as the absorbent.

14313 APTIC NO. 32477

Yamane, Naruto and Shoichi Ito

AIR CLEANER. *(Kuki seijoki). Text in Japanese. (Hitachi Seisakusho K. K. (Japan)) Japan. Pat. Sho 46-16213. 2p., June 5, 1971. (Appl. Aug. 30, 1967, claims not given).*

An electric precipitator has a high-voltage indicator neon lamp which lights up to indicate that a high voltage is being applied to the electric dust collector. A high-voltage generating device made up of several capacitors and diodes is set up in the secondary side of the power transformer and connected to the positive side of the electric dust collector. The negative side of the electric dust collector is grounded. A bridge rectifier circuit consisting of four diodes is also formed on the secondary side of the power transformer. One of the two alternating current terminals of this bridge-type rectifier is connected to the secondary coil of the power transformer, while the other terminal is grounded. A branch circuit, consisting of the neon lamp and a resistor connected in series to each other, is connected to the direct current terminals of the bridge-type rectifier. Also connected to the DC terminals is an electrical circuitry unit consisting of a capacitor and resistor. The latter are connected in series, making the voltage of the capacitor higher than that required at the onset of the neon lamps discharge. Output voltage, amplified to four times that of input voltage is applied to the electric dust collector through a protective resistor. The neon lamp then lighted by power stored in a capacitor charged to a voltage higher than the initial discharge voltage of the lamp, indicating that high voltage is generated in the secondary coil of the transformer. Equipped with the bridge-type rectifier circuit, the otherwise pulsating current is thereby rectified to make the peak current lower, so a neon lamp of a small rated current may be protected. Thus, the lamp will stay brightly lit, even when output current is low.

14314 APTIC NO. 32091

Yamauchi, Hitoshi

ON DUST ELIMINATION EFFICIENCY OF 2-STEP VENTURI SCRUBBER. *(2-dan benturi sukuraba no jojin koritsu ni tsuite). Text in Japanese. Funtai Kogaku (Powder Eng.), 8(7):60-64, July 1971.*

Pressure loss is the greatest defect of venturi scrubbers. If their trapping effect is to be raised, the gas flow velocity must be increased, which raises the amount of water required. As a consequence, the pressure loss is greater, and a bigger blower is required. In designing a venturi scrubber, the optimum operating conditions which are economical must be sought. With a venturi scrubber alone, 10 mg/N cu m is the maximum amount of exhaust which can be cleaned, and an electrostatic precipitator must also be used with the scrubber. However, if the top pressure of the blast furnace is sufficiently high, two venturi scrubbers can be operated alongside one another. A pilot plant study was made to determine if two venturi scrubbers were as effective as using one scrubber and electrostatic precipitator. When the dust concentration at the inlet is three g/N cu m, a dust concentration of 30 mg/N cu m can be achieved at the outlet with a 99% effective venturi scrubber, even with a 2500 mm H20 pressure loss. With a two-step venturi scrubber, two mg/N cu m can be achieved at the outlet, with 97 and 98% effectiveness and the pressure loss divided into 1300 mm and 1200 mm H20. This method is very economical compared to the construction and operating costs of an electrostatic precipitator.

14315 APTIC NO. 32273

Yoder, R. E. and F. M. Empson

THE EFFECTIVENESS OF SAND AS A FILTER MEDIUM. *Am. Ind. Hyg. Assoc. J., vol. 29:107-110, April 1958. 5 refs.*

Sand filters were studied under a variety of conditions to determine their usefulness as a filter medium for aerosols in low humidity air streams. Homogeneous di-octyl-phthalate aerosols were used to test the sand filters. Also, polystyrene latex microspheres of 0.41-, 0.27-, and 0.25-micron radius were atomized and used as solid aerosols. The particle size of the aerosol could be varied to produce homogeneous aerosols of any size in the 0.1-1.0 micron range. The aerosols were produced in a La Mer-type thermal aerosol generator and detected by a smoke penetrometer. Three types of sand were used to determine the effect of sand grain shape on filtration efficiency; local river sand was more effective than Pennsylvania Glass Sand or Ottawa Standard Testing Sand. Filtration efficiency was also greater when the aerosol stream passed down rather than up through the filter. Tests of sand as a filter medium for air saturated with water vapor indicated that the sand filter bed functions as a condenser, with the water collecting in the voids and plugging the filter. The pressure drop across the filter gradually rises as the bed is filled with water until channels form in the sand allowing the aerosol to pass through the filter without being filtered. This condition occurs after a sufficient quantity of moisture-laden air has passed through the filter to deposit enough water to fill completely the voids in the sand. The void fraction (ratio of the interstitial volume to the total volume) of all sands used was approximately 0.38. Ruthenium and iodine were successfully removed from the vapor stream arising from a boiling mixture containing each of these isotopes. There exists an aerosol size for maximum penetration; this size decreases as the aerosol velocity increases.

14316 APTIC NO. 32036

Zapp, John A.

SUMMARY: CONTROL OF LEAD POLLUTION. *Public Health Service, Washington, D. C., Symp. Environ. Lead Contamination, 1965, p. 167-174. (Dec. 13-15.)*

NTIS: PB 198104

Articles pertaining to the control of lead pollution which were presented at the Symposium on Environmental Lead Contamination are reviewed. A reduction consumptive lead contamination could be achieved by prohibiting the use of lead in gasoline, and the possiblility of non-leaded gasolines is discussed. The lead content of food and water might be significantly reduced by prohibiting the unnecessary use of lead in food processing and storage equipment, the use of lead in pipes, and the growing of crops near major sources of lead.

14317 APTIC NO. 32426

Zielke, C. W., H. E. Lebowitz, R. T. Struck, and E. Gorin

SULFUR REMOVAL DURING COMBUSTION OF SOLID FUELS IN A FLUIDIZED BED OF DOLOMITE. *Amer. Chem. Soc., Div. Fuel. Chem., Preprints, vol. 3:13-29, Sept. 1969. 11 refs.*

Combustion of solid fuels within a fluidized bed of lime or dolomite, in addition to pollution control, has great potential for reducing boiler size and cost by locating boiler tubes within the fluidized bed. Combustion studies were undertaken under various conditions with once-through use of dolomite, and the re-use of dolomite was explored using six and a half cycles of alternate regeneration and sulfur dioxide adsorption. The experimental unit consisted of a continuous fluidized combustor, four inches in diameter, with a fluidized bed depth of 36 inches; the bed was supported on a perforated plate above a plenum chamber through which fluidizing gas was fed. A cyclone to recover coal ash and dolomite fines was operated at 350 F, and a filter at 150-200 F. Operating pressure was 8 psig. The solid fuels tested in the combustor were Ireland Mine Coal, Disco Char, and Cresap Char. Sulfur removal, carbon burnout, dolomite fines formation, nitrogen oxides present, regeneration of the dolomite, and sulfation were determined. A process where dolomite is used once and discarded would require at least 0.025 ton of dolomite/ton of coal feed of 4% sulfur; a process in which the dolomite is regenerated would require 0.05 ton or less of dolomite per ton of coal feed.

MEASUREMENT METHODS

14318 APTIC NO. 31806

POLLUTION DETECTION BY REMOTE SENSING. *Environ. Sci. Technol., 5(8):676-677, Aug. 1971.*

Remote sensing techniques -- mapping or detection from aircraft and satellites -- can detect changing pollutant concentrations much easier than a network of fixed sampling stations. Remote sensing technology, which includes radar, sonar, and photographic, spectrophotometric, and geomagnetic processes, will be applied to a 30,000 sq mi area from Philadelphia to Norfolk as part of the CARETS (Central Atlantic Regional Ecological Test Site) program, a collaborative effort of NASA and the U. S. Geological Survey. Objectives of the program are the development of a land use data base and monitoring of its change, the assessment, monitoring, and modeling of changes in the total environmental complex, and the establishement of a regional information service for institutions using remote sensing data.

14319 APTIC NO. 31949

Japan Industrial Standards Committee

METHOD FOR DETERMINATION OF CARBON MONOXIDE IN EXHAUST GAS. *(Hai gasu-chu no issanka tanso bunseki hobo). Text in Japanese. JIS K 0098, p. 1-28, May 1, 1970. 2 refs.*

The Japanese standard for determining carbon monoxide in exhaust gas from fuel combustion, metal refining, chemical reactions, and other processes is discussed. Analytical methods include oxidation/condensation, gas chromatography, nondispersion infrared analysis, and detection tube including colorimetry. The differential pressure method, the vaporization pressure method using a vacuum-type analyzer, and the vaporization pressure method using a gas-passing analyzer are listed under the oxidation/condensation method. Each is described with respect to construction of the analyzer, type of reagent, sampling and analytical procedures, and calculations. Two optional methods are also described: oxidation/titration (the Hopcarite method using a mixture of 60% manganese dioxide and 40% copper oxide) and absorption photometric analysis.

14320 APTIC NO. 31950

Japanese Industrial Standards Committee

METHOD FOR DETERMINATION OF TOTAL SULFUR OXIDES AND SULFUR DIOXIDE IN FUEL GAS. *(Hai gasu-chu no zen io sankabutsu oyobi nisanka io no bunseki hoho). Text in Japanese. JIS K 0103, p. 1-43, Feb 1, 1971.*

This standard specifies analytical methods to be used in determining total sulfur oxides (sulfur dioxide and sulfur trioxide) in flue gas resulting from combustion. The total of sulfur oxides is quantitatively analyzed by the neutralization, Arsenazo III, or barium chloranilite methods, sulfur dioxide is analyzed by iodimetric continuous (conductivity and infrared analysis), or detection tube methods. For each method, sampling devices, sampling locations, and preparation of the sample solution are described. Reagents, operating procedures, and calculations are also given. In the case of conductivity analysis, sampling, trapping, and measuring devices, plus their circuitry, are illustrated. Ways of recording and summarizing measured values are explained. Also cited are 38 sets of applicable standards.

14321 APTIC NO. 31982

Japanese Industrial Standards Committee

METHODS FOR ANALYSIS OF SPECIAL COMPONENTS IN FUEL GASES. *(Nenryo gasu no tokushu seibun no bunseki hoho). Text in Japanese. JIS K 2302, p. 1-34, Sept. 1, 1970. 14 refs.*

Standard methods are given for analyzing the total sulfur, hydrogen sulfide, ammonia, and naphthalene in the combustion gases from fuel gas burning. Quantitative analysis of total sulfur should be made by the dimethyl sulfonazo III method or the gravimetric method in which the total sulfur is measured as barium sulfate. Iodimetric analysis is specified for hydrogen sulfide; neutralization titration is specified for the determination of ammonia or naphthalene. Procedures to be followed in each method are outlined, and apparatus, reagents, and calculation methods are described. For reference, several other measurement methods are described, including the scrubber bottle, dust tube, and T. Burette method for hydrogen sulfide analysis. An analysis method for condensable hydrocarbon is also given. Thirty-four regulatory references are listed. Results are given of various preliminary tests performed in the course of establishing the standards.

14322 APTIC NO. 32102

Japanese Industrial Standards Committee

CARBON DIOXIDE (CALIBRATION GAS FOR ANALYSIS OF AUTOMOBILE EXHAUST GAS). *(Nisanka tanso (Jidosha haiki gasu bunseki no tame no koseiyo gasu)). Text in Japanese. JIS K 0503, p. 1-4, Feb. 1, 1971. 3 refs.*

Specifications are given for calibration gas, i.e., calibration carbon dioxide, for the nondispersion infrared gas analyzer used when measuring carbon dioxide density. The Japanese Industrial Standards provide for the continuous analysis of carbon monoxide, carbon dioxide, and hydrocarbons in automobile engine exhaust. The calibration carbon dioxide is classified into four kinds by concentration: CD5, CD9, CD12, and CD16. Approximate concentration values of the respective carbon dioxides are 5(v/v%), 9, 12, and 16; concentration ranges are 4.50-5.50, 8.00-10.0, 11.00-13.0, and 14.5-16.0. The condensation/vaporization method for the quantitative analysis of CO2 consists of condensing the CO2 in the sample gas with liquid air and vaporizing it. Then, the pressure of the gas held in a specified volume is measured. The results should be checked by gas chromatography. The detector in gas chromatography should be a heat-conductor. The separator should be three to five mm in inner diameter; the fills should be either an activated carbon or silica gel with a grain size of 150-500 micron; and the carrier gas should be of helium or hydrogen of 99.8 v/v% or higher purity. When the gas chromatograph meets these requirements, the peak area ratio between the effluent CO2 and the high-purity CO2 is calculated from the measured results to obtain the density value. This should be compared with the condensation/vaporization method when necessary. Analytical apparatus, reagents, operating procedures, and calculation methods are described for both methods. Instructions are also given on handling the calibration gas and recording the test data.

14323 APTIC NO. 32378

METHODS FOR THE MEASUREMENT OF AIR POLLUTION. PART 3. DETERMINATION OF SULPHUR DIOXIDE. *British Standard 1747, 12p., 1969.*

Requirements for the assembly, installation, and use of apparatus for the determination of atmospheric sulfur dioxide are described. The method is not specific but depends on measurements of the net acidity resulting from the absorption in hydrogen peroxide solution of the sulfur dioxide with varying but normally much smaller amounts of other acid and alkaline gases by titration to pH 4.5 with a standard alkali. At this pH there is no interference from dissolved carbon dioxide arising from normal atmospheric concentrations or from the reagents used. The apparatus includes a suction pump, a gas meter, gas washing bottles, a smoke filter unit, filter paper, a funnel, a pipette, burettes, and measuring cylinders.

14324 *APTIC NO. 32441*

TRANSPORTABLE INFRARED GAS ANALYZER ULTRAMAT A. *(Tranportables Infrarot-Gasanalysegeraet Ultramat A). Text in German. Motortech. Z. (Stuttgart), 32(8):298, Aug. 1971.*

The gas analyzer Ultramat A, which operates on the two beam alternating method, can be used for measuring carbon monoxide, carbon dioxide, methane, sulfur dioxide, and other heteroantomic gases which have absorption bands in the near infrared range. The analyzer and process are examined in detail. The ambient temperature for the measurements ranges between 0 and 45 C. Sampling speed is 2 l/min.

14325 APTIC NO. 32293

Adams, Donald F. (ed.)

AIR POLLUTION INSTRUMENTATION. *Instrument Society of America, Pittsburgh, Pa., Proc. Symp. Air Pollution Instrumentation, Los Angeles, Calif., 1965, 75p. 13 refs. (Oct. 5.)*

A collection of papers, panel discussions, and audience questions and comments are presented from the Instrument Society of America s Air Pollution Instrumentation Symposium held in Los Angeles, October 5, 1965. Instrument requirements for meteorological research, laboratory research, air and source monitoring, and for automotive emissions are reviewed. Certification of automotive exhaust emission laboratories by cross checks of the analytical instruments is discussed, and the application of an electric programming dynamometer in the development of road test tapes is considered. Instrumentation engineering for an air pollution laboratory and faster analyses of nitrogen dioxide with continuous air analyzers are also discussed.

14326 APTIC NO. 31933

Akashi, Nobuko

SIMULTANEOUS QUANTITATIVE ANALYSIS OF ATMOSPHERIC HEAVY METALS BY SQUARE-WAVE POLAROGRAPHY. *(Kukeiha poraroqurafi ni yoru taikichu jukinzoku no doji teiryo). Text in Japanese. Bunseki Kiki (Analysis Instr.), 9(7):10-18, July 1971. 44 refs.*

A polarographic analysis was made of the copper, lead, cadmium, zinc, and iron content of suspended dust in the atmosphere. The dust was sampled with a glass fiber filter and high-volume air sampler, with one-fourth of the filter paper used for analysis. The sampled dust was incinerated at 100 C. The filter paper was immersed in a 20% hydrogen chloride solution and heated for three hours in a hot bath to separate the metals. Then the sample was then filtered, evaporated, dissolved in a 10% HCl solution and quantitatively analyzed by square wave polarography. The effects of the HCl concentration on the peak height of the Cu, Pb, Zn, and Cd polarograms was studied. Similar results were obtained with atomic absorption spectrometry and square wave polarography.

14327 APTIC NO. 32268

Amoore, John E.

COMPUTER CORRELATION OF MOLECULAR SHAPE WITH ODOUR: A MODEL FOR STRUCTURE-ACTIVITY RELATIONSHIPS. *Ciba Foundation, London (England), Taste Smell Vertebrates, Ciba Found. Symp., 1969, p. 293-312. 43 refs.*

The principles underlying olfactory classification and discrimination are reviewed. Initial detectors of sapid or odorous molecules are specialized proteins, having specific affinities for particular classes of compounds. Receptor proteins, primary odors, specific anosmia to isovaleric acid, and protein receptor sites are discussed. Computer assessment of molecular shape by submitting silhouette photographs of molecular models to a pattern-recognition machine is examined. Future possibilities for correlation of structure and activity are projected, with respect to theoretical screening of large numbers of known molecular structures for valuable, but previously unrecognized, biological activities. (Author summary modified)

14328 APTIC NO. 31924

Baba, Yoshio

MEASUREMENT/ANALYSIS OF ODOR AND TECHNIQUES OF OFFENSIVE ODOR PREVENTION. *(Shuki no sokutei bunseki oyobe akushu boshi gijutsu). Text in Japanese. Preprint, Smaller Enterprises Promotion Corp. (Japan), 60p., 1971. (Presented at the Public Nuisance Prevent. Tech. Seminar, Japan, 1971.)*

Odors can be measured by a human panel procedure or with analytical apparatus; the former method is used primarily to determine the intensity of an odor and/or kinds of odors, while the latter method is more often used for the analysis of substances giving a particular smell. Odorants which exist in extremely small quantities can now be detected by gas chromatographic analysis. However, it is still difficult to correlate the detected odorants and the unpleasant odor they are believed to cause. Various olfactory tests are cited. Deodorizing techniques include combustion, scrubbing, adsorption, oxidation, masking, neutralization, and a chemical deodorization method. The preventive measures implemented at the source of odor generation are cited for oil refineries, Kraft pulping, petrochemical processes, chemical processes, painting and printing industries, slaughterhouses, pig and poultry farming, and diesel or jet engine exhaust. The analysis methods are given for acrolein, formaldehydes, acetaldehyde, mercaptans, benzenes, hydrogen chloride, ammonia, and hydrogen sulfide.

14329 APTIC NO. 32367

Balzer, J. LeRoy

FIBROUS AEROSOLS AND SIZE-SELECTIVE SAMPLING. *Industrial Health Foundation, Inc., Pittsburgh, Pa. Trans. Ind. Health Found., Annu. Meet., 35th, Pittsburgh, Pa., 1970, no. 44:87-94. 13 refs. (Oct. 13-14.)*

A theoretical and experimental investigation of centrifugal and gravitational size-selective aerosol sampling devices and of the aerodynamic behavior of asbestos fibers in those sampling devices was presented. The fibrous aerosol generation system was designed to produce a polydisperse aerosol of asbestos fibers. Experimental sampling runs were from 10 to 30 minutes in length; samples were collected on 47 mm 0.8 millimicron membrane filters. All three samplers (elutriator, cyclone, and open filter) were operated simultaneously in aerosol chambers for each run. Size-selective sampling of fibrous aerosol for the respirable fractions using one-half inch cyclones operating at 10 lpm and 18 lpm is not feasible. Fiber diameter categories indicate that large non-respirable fibers are passing the samplers and being recorded as respirable material. Increases in chrysotile and mixed fiber concentrations for the 18 lpm cyclone runs were noted. Thus, the fiber distribution were being altered during passage through the cyclone selective samplers. The elutriator fiber diameter indicated that only a small fraction of the total respirable fiber in the test aerosol was passing to the second stage and being recorded as respirable material. Agglomeration of fibers and other physical factors operating within the elutriator may account for these inconsistencies. It was possible to theoretically describe the orientation of fibers during settling. The experimental results were used to describe the aerodynamic behavior of fibers during settling. Data indicate a vertical orientation to the minor axis for amosite fibers and a random orientation for chrysotile fibers during settling. Agreement with the work of Stoeber and Timbrell was evident; however, a conversion factor for calculating an equivalent diameter for all fibers is questionable. Sampling fibrous aerosols for the respirable fraction is not possible with present size-selective instruments designed for compact particle sampling.

14330 *APTIC NO. 32425*

Barringer, A. R.

CHEMICAL ANALYSIS BY REMOTE SENSING. Instrument Society of America, Pittsburgh, Pa., Symp. Environmental Pollution Instrumentation, New York, 1968, p. 49-67. 17 refs. (Oct. 28-31.)

The correlation spectrometer was originally designed to detect gases of interest for the earth sciences, but its most intensive development has been directed toward air pollution monitoring requirements. A family of devices was produced for both ground and airborne remote sensing applications as well as on-stream monitoring in hostile environments such as inside stacks and flues. The operation of the correlation spectrometer is described. An airborne version of the correlation spectrometer was used to study sulfur dioxide and nitrogen dioxide pollution. The concentrations of pollutant that are measured with the airborne monitor provide a mean value which represents the average between the ground level and the inversion layer. Surveys of this type require reasonably uniform meteorological conditions over the area of survey and also good visibility. To operate the remote sensing instrument at ground level the equipment is set up as close as possible to the stack and the telescope is sited at a point immediately alongside the stack in order to take background readings against the sky. Readings are next taken through the plume at a point just above the top of the stack and below the level of moisture condensation. Good results were obtained when the stacks were working under suitable meteorological conditions. The present state of the art calls for a plume which is rising reasonably straight and has a Ringelmann value of less than two. The scattering problem and measurements inside stacks are discussed.

14331 APTIC NO. 32453

Becker, Herbert

TUNABLE LASER ANALYZES GAS. *(Abstimmbarer Laser analysiert Gas). Text in German. VDI (Ver. Deut. Ingr.) Nachr. (Berlin), 25(31):7, Aug. 1971.*

The spin-flip Raman laser, which can be used to measure concentrations of air pollutants, is examined. The process is defined and the various steps and components of the laser are delineated. The concentrations of the various components of a waste gas sample are measured by the infrared absorption method. The high sensitivity of the method enables the determination of concentrations of 0.1-10 ppm nitrogen oxides. Measurement times at a sample volume of 1 cc is 4 sec.

14332 APTIC NO. 31902

Bernert, Juergen

EXPERIENCE WITH THE DETERMINATION OF HYDROGEN SULFIDE IN WASTE GASES. *(Erfahrungen bei der Bestimmung von Schwefelwasserstoff in Abgasen). Text in German. Wasser Luft Betrieb, 15(7):259-260, July 1971. 18 refs.*

Available methods for determining microgram concentration of hydrogen sulfide include the molybdenum blue sorption, impinger, and methylene blue-impinger methods. Each is based on a color reaction whose intensity is measured by photometry. If H2S is known to be the only pollutant in waste gas, the simplest method is absorption in 10% sodium hydroxide and oxidation to sulfate by means of peroxide or bromium water. After precipitation with barium ions and gravimetric determination, the H2S content can be calculated. Another familiar method is direct precipitation as cadmium sulfide, which is reacted with copper sulfate. The copper of the obtained copper sulfide is electrolytically determined. In the presence of sulfur dioxide, H2S plus the S02 is determined by absorption in 10% sodium lye and oxidation in peroxide solution.

14333 APTIC NO. 32400

Bettan, A.

AUTOMATIC CALCULATION OF RUNWAY VISUAL RANGE ON AIRPORTS. *(Calcul automatique de la porteee visuelle de piste sur les aerodromes). Text in French. Monographies Meteorol. Natl. France, no. 76:31-51, Aug. 1970. 59 refs.*

NTIS: N71-10120

The function of a transmissometer is to emit light rays from a light source, across a stretch of air in the runway area of an aerodrome, to a receiver system which includes a photocell. A current is generated which is compared with a reference current corresponding to a definite light transmission condition. Mathematical formulae of visibility, and an equation for the aforementioned signal current are cited by the author as a basis for establishing a relation between degree of light transmission measured by the transmissometer, and values of visibility on the runway, projected for any distance between 75 and 2000 meters. For this purpose, a distance of 30 m between light source and receiving unit of the transmissometer is recommended. The transmissometers are mounted parallel with the centerline of the runway at a distance of 120 m from the runway centerline. The level of the light transmission is 2.5 m above the ground. The latest practice is to employ up to three transmissometers on a runway, and to feed the combined readings into a computer. For night conditions, particulars of the flare signals on the runway are taken into account in the computer operation. An accuracy within 20% is considered acceptable for the visibility determination.

14334 APTIC NO. 32471

Bhatty, M. K. and A. Townshend

SPECTROPHOTOMETRIC DETERMINATION OF SMALL AMOUNTS OF SULPHUR DIOXIDE BY MOLECULAR COMPLEX FORMATION WITH OMICRON-XYLENE. *Anal. Chim. Acta, 55(2):401-407, July 1971. 15 refs.*

Small amounts of sulfur dioxide were determined by extraction in omicron-xylene from acidified sulfite solutions stabilized by ethylenediaminetetraacetic acid (EDTA). The absorbance of the molecular complex of S02 with o-xylene is measured spectrophotometrically at 296 nm. Only nitrate interferes, and this effect is easily eliminated by adding sulfamic acid. The use of tetrachloromercurate(II) to stabilize the sulfite solutions is less satisfactory because of an increased number of interferences, higher blanks, and less sensitivity. Calibration curves and reproducibility are discussed. (Author summary modified)

14335 APTIC NO. 31834

Bloomfield, Bernard D.

SOURCE TESTING. *In: Air Pollution. Arthur C. Stern (ed.), Vol. 2, 2nd ed., New York, Academic Press, 1968, Chapt. 28, p. 487-536. 44 refs.*

Source testing is usually done where there is acknowledged or suspected pollution or where it is desired to measure the efficiency of collection equipment. In some instances an apparently innocuous individual source is sampled to acquire data on the cumulative effect of many thousand such sources or to determine the effect of process changes on the effluent from the process. Regardless of the study purpose, the sampling procedure utilized should permit a reasonably accurate evaluation of the source expressed in terms of the rate of emission of specific pollutants. Even the simplest stack study required the determination of gas flow, temperature, and humidity in the stack and, in some instances, will indicate process imbalance by virtue of such conditions as unusually high or low stack temperatures, low moisture levels, or erratic gas flow rates. Source testing procedures and planning of the study are discussed. Examples are included illustrating techniques specific to coal-fired power plants, radioactive discharges, incinerators, foundry cupolas, and bake ovens.

Tracer techniques have been successfully used to distinguish the airborne effluents of a particular stack, to evaluate plume dispersion and travel, and to determine the pollutant contribution of one area to another.

14336 APTIC NO. 31842

Boubel, Richard W.

A HIGH VOLUME STACK SAMPLER. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1971. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-114.)*

The development, design, and trial application of a sampling train to gather a relatively large amount of particulate sample in a short period of time are discussed. The high volume train overcomes the shortcomings of other sampling trains and has some additional advantages. It uses the same glass fiber that is specified for ambient air particulate sampling, so that the emission test results are directly comparable to ambient air sampling data. No additional equipment is needed for the emission sampling analysis. The sample collected by the high volume probe may be analyzed microscopically for size and characteristics of the particles, an important factor if the control equipment is to be specified for the process or source. The high volume sampler was evaluated on field tests of wood fired boilers, incinerators, wigwam burners, asphalt batching plants, seed cleaning plants, and wood fiber filtration systems. The results obtained from a variety of sources using this probe indicate that it is both versatile and reliable, and no serious problems in its use have been encountered. (Author abstract modified)

14337 APTIC NO. 31768

Bricard, J. and P. Y. Turpin

A NEW AEROSOL SPECTROPHOTOMETER. *(Un nouveau spectrophotometre d aerosols). Text in French. Aerosol Sci., 2(2):207-217, June 1971. 2 refs.*

Most commerical aerosol spectrophotometers can measure particles down to a size of 0.3 to 0.5 micrometer; a new idea is described which might extend the limit to 0.03 micrometer. The optical principle is the same as that used hitherto but the separation of the weak signal due to the particle from background noise is achieved by applying information theory to the analysis of the pulses of current emanating from the photomultiplier which is normally employed merely as the source of an integral signal. (Author abstract)

14338 APTIC NO. 32410

Brichambaut, C. P. De

OBSERVATION AND MEASUREMENT OF GROUND VISIBILITY. *(Observation et mesure des visibilites au sol). Text in French. Monographies Meteorol. Natl. France, no. 76:1-29, 49-51, Aug. 1970. 59 refs.*

NTIS: N71-10120

In connection with the control of taking off and landing of aircraft on runways, the runway visual range (RVR) is of maximum importance. It is defined as the maximum distance at which either the runway itself, or illuminated marks, or signs can be seen from a position above the runway centerline corresponding to the average eye level of a pilot at the moment of making contact with the ground. For commercial aviation, a height of five meters corresponds to this definition. Since visibility has to be reported to the pilot by the airport control station, methods have been developed for determining the RVR objectively by means of instruments, rather than by eye. The most employed method is based on the use of transmissometers. The basic principle is to measure the average degree of light transmission in the prevailing atmosphere in the landing area through a given shorter distance, and to convert these data to a figure of total length of visibility on the runway. A typical test set-up comprises an electrical projector as light source, with its power supply and regulating device, and a light receiving apparatus. Projector and receiver are usually mounted at a distance of 50 meters from each other. The light source has to be very stable in order to accurately maintain a certain value of intensity of light. The projector includes an optical system for emission of a parallel bundle of light rays. The receiving device consists of an optical system for concentrated light intake, and a photocell combined with an output amplifier. The system includes instrumentation for reading and recording in a control room, remote from the locations of projector and receiver.

14339 APTIC NO. 32187

Brosset, Cyrill

METHODS FOR SULFUR DIOXIDE DETERMINATION IN AIR. *In: Recommendations Relating to Norms for Sulfur Dioxide Content in Open Air. (Rekommendationer rorande riktvarden for svaveldioxidhalt i utomhusluft). Swedish Government Air Pollution Board, Stockholm, Communication 6601, 1965 (?). 1 ref. Translated from Swedish by Scientific Translation Service, Inc., Santa Barbara, Calif., p. 27-32, 1967.*

Methods for determining short-term and daily average values of sulfur dioxide and for continuous measurement are described. For 24 hours an even current of air corresponding to about 2 cu m per day is passed through 50 ml of 1% hydrogen peroxide solution contained in a wash bottle. The height of the water column should be at least 3 cm. The analysis is carried out as a titration, the end point being indicated with the reagent thorine which yields an orange-colored complex with barium ion. The determination thus gives the amount of sulfate formed. The thorine method can be adapted for automatic series analysis using an auto-analyzer. A method of determining short-time averages is based on adsorption of SO2 on silica gel in which a current of air is passed through a tube containing the gel. Analysis is performed by desorption of SO2, reduction with hydrogen gas over a platina catalyst at an elevated temperature to hydrogen sulfide, which in a solution of ammonium molybdate forms molybdenum blue, which in turn can be photometrically determined. Another method for short-term averages depends the absorption of SO2 in chloromercurate solution. The SO2 is then determined by a colorimetric reaction produced by adding pararosaniline hydrochloride. The principal value of this method is its sensitivity and specificity. Continuous recording of sulfur dioxide in Sweden is limited to the Picoflux, based on the conductivity principle.

14340 APTIC NO. 31953

Buehne, Karl-Wilhelm

STUDIES OF THE DEPENDENCE ON DIRECTION OF PHOTOELECTRIC SMOKE DENSITY MEASURING UNITS. *(Untersuchungen ueber die Richtungsabhaengigkeit von fotoelektrischen Rauchdichtemessgeraeten). Text in German. Staub, Reinhaltung Luft, 31(7):285-290, July 1971. 7 refs.*

Practical use of photoelectric smoke density measuring units which operate on the extinction principle revealed that a connection exists between the indicated measurement value and the specific dust content in the flue gas. This relationship was indicated by changes dependent upon the location of the measuring unit and the local operating conditions. Through modification of the equipment (additional ventilation with filtered air), problems such as soiling were eradicated. The optical layout was changed so that a large, homogeneous spot of light which fully illuminates a small reflector was produced to avoid what had been a highly directional response. Test results are reported pertaining to the directional response of the old and new types of instruments.

14341 APTIC NO. 32416

Bugendahl, Al

A LOW LEVEL SO2 MONITOR. *Preprint, 18p., 1970 (?).*

This script for an audio-visual presentation discusses a low level sulfur dioxide monitor. The Ericsen SO2 sensor is a sealed electrochemical cell which consists of a sensing electrode and a counter electrode in an aqueous electrolyte, enclosed in an electrode housing. The membrane is a semipermeable silicon polymer material that readily, and to some degree selectively, facilitates SO2 diffusion into the cell where it is electro-chemically oxidized. The oxidation is driven by the external application of 130 millivolts between the sensing electrode and the counter electrode. Since the transport of SO2 through the membrane is directly proportional to its concentration in the gas stream outside the cell, the oxidation current measured from a background level is directly proportional to this SO2 level. Operating variables, interferences, and plots of oxidation current versus SO2 concentrations are indicated.

14342 APTIC NO. 32168

Burn, G. P.

AUTOMATIC CONTROL FOR A COULTER COUNTER. *World Med. Electron. (London), 5(12):344-346, Dec. 1967. 6 refs.*

The manual Coulter Counter was automated without changing the glassware. The glass tap at the top of the apparatus was left open and connected to a solenoid valve called the COUNT valve and a roller pump to provide suction. The valve and pump were energized together; it was found that a roller pump provided the necessary degree of gentle suction to suit the movements of the mercury in the reservoir. When the pump was switched off, the driving motor did not stop instantly because of the inertia of the rotor. The beaker was made a permanent structure around aperture and the external electrode and was fitted with inflow and outflow tubes. The cell suspension was pumped in. Counting was initiated by operation of the COUNT valve and roller pump. The Coulter type 5 manometer is constructed so that the mercury takes 20 sec to run between the contacts. A leucocyte count is described.

14343 APTIC NO. 32054

Carter, W. Julian, Jr.

A LITERATURE SURVEY AND ANALYSIS OF MISTS 1-10 MICRON SIZE AND MOISTURE SEPARATORS. *MSA Research Corp., Evans City, Pa., AEC Contract AT(45-1)-2145, MSA A-720460, 44p., Jan. 21, 1970. 175 refs.*

NTIS: MSAR 70-10

A literature survey on 1-10 micron aerosol mists and moisture separators was presented. Information from 38 sources were used in the report. The most promising information was found under the subjects aerosols, droplets, filters, light scattering, and particle size determinations. It was suggested that light scattering, though applicable to nonvolatile droplets in the submicron range and laser holography in the above 20 micron range, would require development beyond the current scope of the current level of effort. Cascade impaction appeared to offer the most feasible approach, since in situ fractionation size classifications can be accomplished at various temperatures and pressure, thus minimizing physical changes in droplet size. Filtration and separation are effected by diffusion, Brownian motion, and other factors. The most information on moisture separators was found under mist elimination and moisture separators. The mechanism of inertial impaction with fine fiber mesh will probably most effectively eliminate droplets in the 1-10 micron size range. The most promising materials must be based on the nature of the mist impurities. Where none exists, as for pure water, almost any material could be used. The constraints of resistance to alkalies, high radiation fields, high temperature, and high pressure require that a careful evaluation be made to disclose the best material. A glossary is also included. (Author summary modified)

14344 APTIC NO. 32316

Champagne, D. L.

STANDARD MEASUREMENT OF AIRCRAFT GAS TURBINE ENGINE EXHAUST SMOKE. *Preprint, American Society of Mechanical Engineers, New York, 11p., 1971. 19 refs. (Presented at the American Society of Mechanical Engineers Gas Turbine Conference and Products Show, Houston, Tex., March 28 - April 1, 1971, Paper 71-GT-88.)*

Equipment and procedures of a standard system for measuring smoke emitted by aircraft turbine engines are reviewed. An experimentally determined relationship between the system parameters and true smoke density (weight of solids per unit volume) is presented and theoretically examined. Smoke emission from aircraft gas turbine engines generally contained two groups of carbonaceous solid particles. The smaller particles, less than or equal to 1 micron in diameter, were the primary cause of plume visibility and constituted 50% or more by weight of the total solids emission. The second group consisted of large solid particles 1 to 15 micron or more in diameter; they did not contribute appreciably to plume visibility. The handbook value of 2 g/cc for amorphous carbon was representative of the density of carbonaceous solid particles emitted.

14345 APTIC NO. 32298

Chipman, John C., John Chao, and Douglas R. Liljedahl

THE APPLICATION OF AN ELECTRIC PROGRAMMING DYNAMOMETER IN THE DEVELOPMENT OF ROAD TEST TAPES. *Instrument Society of America, Pittsburgh, Pa., Proc. Symp. Air Pollution Instrumentation, Los Angeles, Calif., 1965, p. 40-53. 3 refs. (Oct. 5.)*

The instrumentation and method for recording vehicle engine operating parameters on magnetic tape is described and the playback system and procedure for reproducing road driving patterns on a laboratory engine, by means of an electric programming dynamometer, are presented. A technique for evaluating, comparing, and selecting a standard road test tape is demonstrated. A test vehicle was equipped with a tape recorder and three transducers for converting engine RPM and manifold vacuum values into frequency modulated signals. Variations in engine RPM and manifold vacuum values, with respect to time, are indicative of the operation of a vehicle. The dividing of road tapes into trips, followed by further division into volume units, allows comparison of emission concentrations from various driving patterns (business vs. residential, freeway vs. arterial). A difference in temperature potential was observed between the standard test cycle and the average road trip, which suggests that the cycle may not be truly representative of a metropolitan trip in the Los Angeles area. (Author abstract modified)

14346 APTIC NO. 31914

Cho, Boong Y. and Larry B. Anderson

SULFUR DIOXIDE MEASUREMENT SYSTEM. *(Atomic Energy Commission, Washington, D. C.) U. S. Pat. 3,578,406. 4p., May 11, 1971. 5 refs. (Appl. March 3, 1969, 10 claims).*

An improved method for the quantitative determination of sulfur dioxide gas is presented. It uses a specific chemical reaction to convert the S02, or its simple conversion product, to a water soluble heavy metal ion complex in which the metal has a relatively high atomic number. The S02 is passed through an aqueous mixture containing mercurous chloride which is insoluble in the aqueous medium. The S02 in water forms sulfurous acid which, in turn, reacts with the mercurous chloride to form mercury metal and a water soluble bis-sulfitomercurate complex containing the heavy metal and mercury, the latter having a high atomic number. Quantitative determination of the bis-sulfitomercurate complex is accomplished nucleonically either by measurement of attenuation of nuclear radiation by the sample, or by measuring the excited L-X-rays of mercury which are detected by a suitable radiation detector system, such as sodium iodide crystals or a proportional counter. Previous methods utilized a radioisotope of iodine and, while such methods were sensitive, they had the disadvantage of also being sensitive to interferents such as hydrogen sulfide and the short half-life of radioactive iodine.

14347 APTIC NO. 32189

Chovin, P. and J. Lebbe

CHROMATOGRAPHY OF AROMATIC HYDROCARBONS. I. THE DETERMINATION OF GAS CHROMATOGRAPHY OF AROMATIC HYDROCARBONS IN THE AIR OF WORKING ENVIRONMENTS. *Occupational Health Rev. (Ottawa), vol. 19:3-10, 1967. 4 refs.*

A rapid and specific method is described for the determination of a series of aromatic hydrocarbons present in the atmosphere of working premises. The samples may be taken either immediately or over a determined time lapse, set in advance (30 minutes for example), by using sampling containers of a special type which can be easily built. The method of determination requires the use of a gas chromatograph equipped with a sensitive flame ionization detector. The simplicity of the calibration makes the method useful in laboratories which are not particularly specialized. (Author abstract)

14348 APTIC NO. 32266

Craig, D. K.

SOME FACTORS INVOLVED IN THE INTERPRETATION OF ROTAMETER AIR FLOW READINGS. *Preprint, Battelle-Northwest, Richland, Wash., Biology Dept., 20p. (?), 1970 (?). 8 refs.*

Rotameters are extensively used to measure the flow rate through air sampling systems. The true flow rate is directly proportional to the product of the indicated flow rate and the square root of the pressure at the flow meters. The importance of calibrating rotameters under exactly the same conditions as those under which they will be used is examined. Calibration data is presented to demonstrate the magnitude of the errors that can arise when using a rotameter downstream of a sampling device across which there is a pressure drop. A pressure gauge is always needed to measure the pressure at the flowmeter, thus enabling corrections to be applied and serving as a leak detector since, for a given sampling device and flow rate, the pressure drop should be roughly the same from one sample to another. Flow rates that will give as low a pressure drop as possible and meter readings at the upper end of the rotameter scale are also desirable. (Author summary modified)

14349 APTIC NO. 32433

Dorsey, J. A. and J. O. Burckle

PARTICULATE EMISSIONS AND PROCESS MONITORS. *Chem. Eng. Progr., 67(8):92-95, Aug. 1971. 19 refs.*

Increasing efforts to define the extent of air pollution and develop control technology for particulate emissions has shown the many disadvantages of applying manual methods to routine measurement on a major scale. The most significant of these are the high cost of performing a series of tests, and the inability of the techniques to provide a continuous record of instantaneous emission rates. The accuracy of a particulate mass monitor is ultimately a function of the representativeness of the sample, and the degree to which the sensor responds to true mass. The most significant factors influencing both areas are the properties of the particulate matter or, more precisely, the net effect of the properties of many minute, discrete particles. These include particle size, shape, density, color, resistivity, and composition. In addition to the physical and chemical properties of the particles, the effects of gross flow of particulate in the source must be carefully considered. Sampling techniques and sensing principles are discussed. For in-situ measurements, the absorption of visible light, gamma rays, and acoustical energy have been investigated.

14350 APTIC NO. 32269

Doving, Kjell B.

EXPERIMENTS IN OLFACTION. *Ciba Foundation, London (England), Taste Smell Vertebrates, Ciba Found. Symp., 1969, p. 197-225. 55 refs.*

Some analytical methods which can be used to facilitate the correlation between biological data and physicochemical parameters are examined. The mechanisms of coding the quality of the olfactory messages at different levels within the system are discussed. Electrophysiological and psychophysical data are the results of the discriminatory mechanisms. These data contain information pertinent to the question of what physicochemical parameters determine odor quality. The data from the biological experiments give matrices where the relationships between the odors are ranked. Three methods for transferring such data on the ranked relationships between odors to multidimensional scaling are examined. The results of these scaling procedures give odor spaces that are obtained exclusively on data from biological experiments. In conjunction with multidimensional scaling methods, a way of grouping the odors by a hierarchical method is described. A method by which the odor spaces are fitted and correlated to known physicochemical parameters is examined. (Author summary modified)

14351 APTIC NO. 32008

Driscoll, J. N., A. W. Berger, J. H. Becker, J. T. Funkhouser, and J. R. Valentine

DETERMINATION OF OXIDES OF NITROGEN IN COMBUSTION EFFLUENTS WITH A NITRATE ION SELECTIVE ELECTRODE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1971. 16 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-149.)*

Nitrate ion selective electrode was investigated as an alternative approach to the present colorimetric determination of nitrate resulting from oxidative absorption of nitrogen oxides from combustion effluents. The electrode offers advantages of speed and relatively simple experimental procedure. Replicate measurements of 0.0001 to 0.01 M nitric acid solutions using bracketins standards show that the electrode approach is capable of good precision with a coefficient of variation of about 4%. Comparison of a method utilizing the nitrate electrode with the more laborious phenol disulfonic acid method for the measurement of nitrogen oxides in both oil and gas fired combustion effluents showed agreement with 4% of the mean, even in the presence of high levels of sulfur dioxide. The correlation coefficient found for phenol disulfonic acid versus nitrate electrode is 0.987. (Author abstract modified)

14352 APTIC NO. 32445

Effenberger, Ernst

MEASUREMENT ERRORS OF THE MOST COMMON DUST SEDIMENTATION MEASURING UNITS. *(Messfehler der gebraeuchlichen Staubniederschlags- Messgeraete). Text in German. Staub, Reinhaltung Luft, 31(7): 273-278, July 1971. 11 refs.*

Measurement results are subject to systematic errors, caused by errors in the measurement setup, or accidental errors, which are unavoidable. Accidental errors, which can be estimated and taken into account, are normally distributed and are a measure of the quality of the results. Dust sedimentation measurement errors are largely accidental and are caused by inhomogeneous distribution and selective sedimentation of the dust particles in the atmosphere; differences in the environment where the units are set up; and differences among the various measurement units. For the determination of measurement errors, several units are set up on the smallest space, and comparative measurements are conducted over a certain time. Standard deviation is computed from thee measurement results by variance analysis. A linear regression equation was computed for the connection between the quantity of dust sedimentation and the standard deviation of the accidental error. Standard deviations are computed for Bergerhoff, Loebner-Liesegang, and Hibernia funnels and Diem foils.

14353

Feldstein, M. APTIC NO. 32107

MEASUREMENT AND CONTROL OF REGIONAL AIR QUALITY. *Preprint, Inst. of Electrical and Electronics Engineers, San Francisco, Calif., and Western Electronic Manufacturers Assoc., Los Angeles, Calif., 7p., 1971. 3 refs. (Presented at the Western Electronic Show and Convention, San Francisco, Calif., Aug. 24-27, 1971.)*

A summary is presented of current instrumentation recommended for the measurement of contaminant concentrations to determine compliance with Air Quality Standards. In most cases the epidemiological criteria which led to the establishment of the standards made use of similar techniques. Even though some of the instruments are relatively non-specific, correlation data have been obtained relating the concentration of the contaminant being measured and its impact on health. The air quality standard for oxidant is 0.08 ppm averaged over one hour, at the federal level, and at the present time for California, 0.10 ppm. The recommended technique for oxidant sampling is based on the reaction between ozone and potassium iodide to form I in a wet chemical solution. California standards for carbon monoxide specify 10 ppm averaged over one hour, compared to federal standards of nine ppm for eight hours and 35 ppm for one hour. The recommended method is based on non-dispersive infrared spectrophotometry. Conductivity, colorimetric, and coulometric techniques exist for the determination of sulfur dioxide. The air quality standard for nitrogen dioxide is 0.25 ppm in California and 0.05 ppm for the federal government. The recommended method is based on the colorimetric reaction between N02 and an amine dye complex. A flame ionization detector is recommended for determining hydrocarbons. and a high-volume sampler is suggested for determining particulates. (Author summary modified)

14354

Fukui, Shozo APTIC NO. 32476

METHOD OF MEASUREMENT OF HARMFUL MATTERS IN AIR. *(Kuki chu no yugaisei busshitsu no sokutei hoho). Text in Japanese. Bunseki Kiki (Analysis Instr.), 9(8):43-59, Aug. 1971. 1 ref.*

Various measurement methods of harmful matter in the atmosphere are examined. The orthotolidine method is described for chlorine determination, but there is no reliable method for a high incidence of pollution by chlorine gas. The neutral iodine potassium method for ozone and oxidants; the atom light absorption method for cadmium; the pyridine pyrazole and palladium quinolinol methods for hydrogen cyanide; the dithizone and atom light absorption methods for mercury; and the diazotation and Saltzman methods for nitrogen oxides are reviewed. The atom light absorption method is generally used for lead and zinc, since it is simple and accurate. Sulfur dioxide is trapped with sodium chloride and mercuric chloride in solution; rosaniline formaldehyde is then added, and the mauve color is determined. Fluorides or hydrofluorine are measured by colorimetry, i.e., the lanter-alizarin complexion method. The 3-methyl-benzo-thiazolon- hydrazone method, which is most sensitive, and the chromotropic method are used to measure formaldehyde. Hydrogen sulfide is determined by the methylene blue method, the molybdenum blue method, and the starch iodine method. The methylene blue method gives a unique reaction and involves less obstruction. A new method for trapping sulfides is examined.

14355

George, Ralph E. and John E. Williamson APTIC NO. 32353

TESTING INCINERATOR PERFORMANCE. *In: Principles and Practices of Incineration. Richard C. Corey (ed.), New York, Wiley-Interscience, 1969, Chapt. 10, p. 254-289.*

In any incinerator program, it is necessary to know the type and quantity of pollutants emitted into the atmosphere from incinerators of different kinds. Such data are important to the designer, the manufacturer, and air pollution control officials. Test stations may be situated at the top or outlet of the stack or in the ductwork leading to or within the control equipment. Gas velocity measurements should be made at the locations where gas samples are taken, and sampling sites should be situated at points where the gases have been well mixed and are as free as possible from distortion and nonuniformity of flow. The collection devices may use principles of inertial separation, filtration, wet or dry impingement, liquid scrubbing, or condensation. Factors involved in representative sampling, sample-nozzle selection, and the actual sampling procedure are discussed in detail. Integrated samples of gas for Orsat analysis are collected by a liquid displacement method. The sequence of calculations from data obtained during sampling and processing of the collection trains for particulate matter is volume of sampled stack gas, water vapor content of stack gas, stack gas density, particulate matter concentration, combustion contaminants, mass flow rate, and efficiencies. Each of these calculations is fully explained.

14356

Grodzinska, K. APTIC NO. 31932

ACIDIFICATION OF THE TREE BARK AS A MEASURE OF AIR POLLUTION IN SOUTHERN POLAND. *Bull. Acad. Polon. Sci., Ser. Sci, Biol., 19(3):189-195, April 1971. 12 refs.*

The pH value and buffer capacity were determined for bark samples of deciduous 00000trees (lime, ash, oak, hornbeam, alder) and one shrub (hazel) from the polluted region of Krakow and for comparison in the Bialowieza Forest. A good correlation between acidification of tree bark and air pollution by sulfur dioxide in these areas was found. The pH values of bark samples ranged from 3.34 to 4.90, and all trees showed the least acidic reaction in the control area (Bialowieza Forest), slightly more in the Niepolomice Forest near Krakow, more near steel mill, more in suburbs of Krakow, and the most acidic reaction in the center of this city. The buffer capacity of the bark also increased with air pollution. Acidification of the tree bark is caused both by local emissions of sulfur dioxide from industry, heating, and motor transport and by the significant acidification of rain from Western Europe. (Author summary)

14357

Groth, Richard H., Daniel S. Calabro, and Donald G. Gardner APTIC NO. 31756

EVALUATION OF THREE WET CHEMICAL METHODS FOR DETERMINING CARBONYL IN TURBINE EXHAUST GASES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1971. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-151.)*

Various wet chemical methods used or suggested for the determination of carbonyl content in air pollution work were evaluated in a laboratory study: the MBTH method for aldehydes, the sodium bisulfite method for aldehydes and methyl ketones, and a method developed by L. J. Papa for aldehydes and ketones. The variables considered were: range of usefulness in terms of carbonyl concentration; efficiency of collection; effect of contaminants, specifically nitrogen oxides, sulfur dioxide, and olefins; and effect of storage prior to spectrophotometric measurement. All three methods are suitable for measuring levels of carbonyl normally expected in the exhaust of gas turbine engines. The efficiency of collection is satisfactory in all cases. Aging of the exposed solution causes no significant errors except in the MBTH method at low aldehyde levels. The sodium bisulfite method yielded excellent results in the presence of contaminants tested. At low aldehyde levels, olefins and sulfur dioxide cause errors in the MBTH method. In the method developed by Papa, sulfur dioxide interference in aldehyde analyses is very marked and suggests limiting the use of this method to samples containing only small amounts of sulfur dioxide. (Author abstract modified)

14358 APTIC NO. 32439

Hamao, Yoshio, Yasuo Miyata, and Tomonori Takeda

SOME CONSIDERATIONS OF MEASURING METHODS FOR DETERMINING NOX. *(Chisso sankabutsu (NOx) sokuteiho ni kansuru ni-san no kento). Text in Japanese. Ishikawajima Harima Giho (Ishikawajima-Harima Eng. Rev.), 11(2):77-82, March 1971. 5 refs.*

Two analytical methods for the determination of nitrogen oxide content were examined. The naphthyl-ethylene diamine (NEDA) or Saltzman method and the phenoldisulfonic acid (PDSA) method were studied with respect to reproducibility, accuracy, and scrubbing effect of the acidic solution on sulfur dioxide. Reproducibility was poor for the NEDA method using air oxidation but highly stable for the NEDA method with oxygen oxidation and for the PDSA method. The value obtained for the NEDA method after 16 hours of oxygen oxidation was greater than that obtained after 16 hours of air oxidation. The measured value was about 25% higher than the real value. The PDSA value calculated similarly was very close to the real value. When SO2 coexisted in the gas, the measured value of NOx obtained by the NEDA method was lowered but was not affected for the PDSA method. Both hydrogen peroxide and sulfuric acid solutions were effective in removing SO2. Absorption of NO by these SO2 absorbents was negligible but NO2 absorption could not be ignored. The Saltzman factor, from test results by the NEDA method, was 0.625.

14359 APTIC NO. 31977

Hearn, John R.

AN ENGINEER S VIEW OF AIR POLLUTION MEASUREMENTS AND THE POTENTIAL OF MICROWAVE SPECTROSCOPY. *Preprint, Inst. of Electrical and Electronics Engineers, San Francisco, Calif. and Western Electronic Manufacturers Assoc., Los Angeles, Calif., 8p., 1971. 8 refs. (Presented at the Western Electronic Show and Convention, San Francisco, Calif., Aug. 24-27, 1971, Paper 3214.)*

The requirement for a dry method has led to the investigation of spectroscopic techniques using all parts of the electromagnetic spectrum. Some of the properties of microwave spectroscopy are discussed in order that its potential may be assessed. Being very sensitive to changes in the moment of inertia of the molecule, the microwave spectra can differ drastically between two chemically identical molecules, if the second molecule contains a different isotope of one of its constituent atoms than the first. To demonstrate this specificity, some arbitrary mixtures of sulfur compounds were made up, and the spectra of the individual components were seen not to interfere and to be clearly resolved.

14360 APTIC NO. 31885

Henderson, J. S.

PLANNING FOR AIR POLLUTION CONTROL. PART II – AMBIENT AIR SAMPLING. *Plant Eng., 24(18):58-60, Sept. 3, 1970.*

Under the 1967 Air Quality Act, the Department of Health, Education, and Welfare is designating air quality control regions and establishing ambient air criteria. Sampling generates the needed data by providing a description of a plant s pollution impact on the atmospheric environment. Sulfur dioxide monitors consist of automated, semiautomated, and static instruments. Conductivity, coulometry, or colorimetry automated instruments employ direct reading strip charts or paper punch-tape data readouts. A less complex sequential sampler consists of a gas bubbler, flowmeter, gas pump, and sequencing timer. The absorbing reagents are analyzed in the laboratory, usually by the West-Gaeke method. Sulfation sampling is also mentioned, and excellent correlation exists between the candle and dish methods. High-volume samplers, open-topped dustfall containers, and windblown dust techniques are described for the sampling of particulates. Other valuable parameters include haze, wind direction, and wind speed. A number of techniques can be used to minimize sampling costs and maximize data output.

14361 APTIC NO. 32081

Hiebert, R. D., R. G. Stafford, and L. L. Pollat

IMPROVED LIGHT SCATTERING PHOTOMETER FOR AIR FILTRATION SYSTEM STUDIES. *Los Alamos Scientific Lab., N. Mex., Atomic Energy Commission Contract W-7405-eng-36, Rept. UC-41, TID-4500, 7p., 1971. 3 ref.*

NTIS: LA-4627-MS

A light scattering photometer for measuring aerosol concentrations which offers a high degree of sensitivity and stability with negligible electrical noise is presented. Sensitivity and linearity were provided which allow detection of 0.3 micron particles in concentrations as low as 2.5 times 10 to the minus 7th power micrograms per cubic centimeter (15 particles/cc). A solenoid valve incorporated into an automatic pushbutton control sampling system, eliminated impaction problems and was leak proof at pressures in excess of those usually encountered in the normal operation of the photometer. (Author abstract modified)

14362 APTIC NO. 31853

Hochheiser, S., F. Burmann, and G. B. Morgan

CURRENT ATMOSPHERIC MONITORING METHODS. *Preprint, Environmental Protection Agency, Raleigh, N. C., Bureau of Air Pollution Sciences, 28p., 1971. 10 refs.*

Atmospheric monitoring in the United States is aimed at the systematic collection and evaluation of aerometric and related data to provide information on pollutant concentrations in ambient air, emissions from polluting sources, and meteorological conditions. Current methods are highly variable due to the complex number of pollutants that must be monitored and measured. Methods and instruments must be considered in view of specificity, sensitivity and range, stability, precision and accuracy, sample averaging time, reliability, and feasibility, and for continuous automatic monitoring instruments, zero drift and calibration, response, lag, rise, and fall times, ambient temperature and humidity, maintenance requirements, and data output. Reference and equivalent methods and standard methods for calibrating instruments must be developed. Commonly used air sampling techniques include mechanized samplers, bubbler devices, automatic sampler-analyzers, and solid-state sensors. Commonly used continuous automatic instrumental methods include the pararosaniline colorimetric method, which is now the reference method, conductrimetric method, electrochemical method, chemiluminescent method, nondispersive infrared analysis, flame ionization detector, and diazotization and coupling technique. Calibration techniques necessary for accurate data are discussed. The conclusion indicates a need for continuous development and improvement of monitoring methods, development of low-cost reliable instruments, and standardization of methods.

14363 APTIC NO. 32296

Hocker, Arthur J., William O. Yates, Paul M. May, and M. Patrick Sweeney

CERTIFICATION OF AUTOMOTIVE EXHAUST EMISSION LABORATORIES BY CROSS CHECKS OF THE ANALYTICAL INSTRUMENTS. *Instrument Society of America, Pittsburgh, Pa., Proc. Symp. Air Pollution Instrumentation Los Angeles, Calif., 1965, p. 26-39. 2 refs. (Oct. 5.)*

The methods used by the State of California at its laboratory for testing automotive exhaust emissions, and the techniques employed and results of typical cross check precertification tests are described. The test unit at the California Vehicle Pollution Laboratory consists of a chassis dynamometer on which the test vehicle is run and a complex instrument train containing four nondispersive infrared analyzers, one each for carbon monoxide and carbon dioxide and two for hydrocarbons. The test procedure and data processing are described. When precertification cross check exhaust emission tests were made between CVPL and private laboratories, it was clearly demonstrated that similarly equipped and instrumented laboratories in various locations can duplicate the results obtained by another facility.

14364 APTIC NO. 32511

Honma, Katsunori and Koichiro Hirano

ESTIMATION METHOD OF AEROSOL DIAMETER BY MEANS OF FILTERING MECHANISM. *(Roka kiko o riyo shita erozoru no ryukei sokutei ho). Text in Japanese. Rodo Eisei Kenkyusho Nenpo (Ann. Rept. Natl. Inst. Ind. Health), p. 47-48, July 1971.*

Using a standard monodisperse aerosol, experiments were carried out to determine how precisely the aerodynamic mean diameter could be estimated. Different concentrations of aerosols and filters with different collecting rates were classified according to particle size. The relation between the aerodynamic mean diameter and collecting rate could be expressed graphically in one curve even though concentrations varied. Thus, this method can be used to obtain the aerodynamic mean diameter within a 10% error.

14365 APTIC NO. 32176

Hounam, R. F.

THE FILTERING EFFICIENCY OF SELECTED PAPERS. *Ann. Occupational Hyg., vol. 4:301-303, 1962. 4 refs.*

Cellulose, cellulose asbestos, and glass fiber filter papers were tested to ascertain the most suitable paper for use in type 1042 and type 1355 dust samplers. Both instruments use a fan to aspirate air through a small area of filter paper on which the dust is retained, the fans providing only a limited amount of suction. The ratio of percentage penetration to resistance to air flow (P/R) provided a convenient index to the relative efficiency of the different papers (for the methylene blue assessment) for a given resistance. The highest values of P/R were obtained for cellulose papers of low resistance.

14366 APTIC NO. 31841

Hudson, Arthur E. and Richard W. Boubel

SAMPLING OF EMISSIONS FROM A MOBILE AGRICULTURAL INCINERATOR. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 28p., 1971. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-115.)*

A sampling system developed to sample particulate and gaseous emissions from the stack of a mobile incinerator is described. The system was designed to collect a particulate sample on a high volume sampler-fiber glass filter and collect a gaseous sample in a plastic bag. Particulates and gaseous hydrocarbons were measured. The high volume sampler was calibrated with a system that divided the total flow into two more easily measureable balanced flows. Isokinetic sampling conditions were impractical to attain on the moving source, but were approximated using velocity measurements during fixed tests of the incinerator. To adjust emission values to 12% carbon dioxide, the CO2 content of all gaseous samples were measured with a Beckman infrared analyzer. Total gaseous hydrocarbons were measured with a flame ionization detector. A gravimetric analysis was performed on each particulate sample. A particulate sample was found to consist of 5% combustibles and 95% uncombustibles, indicating that a large amount of dirt was being entrained with the straw fuel. A particle size analysis was performed by light field microscopy and a bimodal distribution was found. Data on several typical samples are also included. (Author abstract modified)

14367 APTIC NO. 32501

Irmscher, G., P. Schulz, H. Thuermer, and I. Werner

OCCUPATIONAL HYGIENE MEASUREMENTS, EVALUATION, AND COMBAT OF SILICOSIS PROVOKING DUSTS. *(Arbeitshygienische Messung, Bewertung und Bekaempfung silikogener Staeube). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 17(7):468-470, July 1971. 6 refs.*

Since only particles smaller than five micron penetrate the lung tissues, the particle size of the grains of free crystalline silicic acid is an important factor in determining how much harm will be caused by this component of dust. Regular determinations of the amount of dust to which a person is exposed are necessary fo the prevention of silicosis. Dust concentration may be determined as the number of suspended particulates/cu m of air or as the mass in mg/cu m. Numerical and gravimetric concentration measurements generally cannot be compared with each other. Since gravimetric methods are preferred on the international level, the konimeter which has been used in West Germany will have to be abandoned as it provides numerical results. Various other methods which are available for the determination of the silicic acid content of dust include: radiographic phase analysis, differential thermoanalysis, phase contrast and polarization microscopy, electron microscopy, and infrared spectroscopy. While the optical methods require only very small samples, all other methods require samples of 10 to 150 mg.

14368 APTIC NO. 32311

Ivlev, L. S., V. M. Klevakin, N. N. Proskurnina, and A. A. Treskunov

ON THE METHODICS OF STUDY OF AEROSOLS OF VARIOUS NATURE. *(Nekotoryye metodicheskiye osobennosti izucheniya aerozoley razlichnoy prirody). Text in Russian. Med. Tekhn., no. 3:17-21, 1968. 7 refs.*

The study of the concentration of some biological aerosols, their sedimentation, and the fractionation of a dispersed phase has several problems using a two-cascade impactor with a circular nozzle. The determination of the instrumental efficiency, on the basis of the weight distribution of sedimented particles, is rather inaccurate. For instruments measuring aerosol concentration, the efficiency with respect to aerosol size is a basic characteristic, since the efficiency of any instrument for a given aerosol can be determined from its distribution curve. For an aerosol of a given dispersion, the efficiency of the instrument with respect to weight distribution or light signal decrease may be numerically close to its efficiency with respect to the radius distribution curve. A simple method to obtain the weight distribution or the decrease in light signal from a radius distribution curve, and vice versa, is given. As an example, the two-cascade impactor is calculated for the separation of protein particles and atmospheric aerosols according to their size.

14369 APTIC NO. 32496

Jaeger, Jiri

IDENTIFICATION AND DETERMINATION OF PYRENE AND BENZO(A)PYRENE QUINONES BY MEANS OF FLUORESCENCE SPECTROGRAPHY AT MINUS 197 C. APPLICATION TO AIR POLLUTION ANALYSIS. *Z. Anal. Chem. (Berlin), 255(4):281-284, 1971. 9 refs.*

A method is described for the identification and determination of pyrene and benzo(a)pyrene quinones. It is based on the successive thin-layer chromatographic separation on alumina (with toluene/ether: 3:2) and silica gel (with benzene/acetone: 9:1) and the fluorescence measurement of the isolated substances by spectrophotometry. The photochemical reaction of pyrene and benzo(a)pyrene quinones in their ethanolic solutions forms intensively fluorescent products. The sensitivity and selectivity of the estimation is enhanced by recording fluorescence spectra of these substances at the temperature of the boiling point of liquid nitrogen. The limits of detection for pyrene and benzo(a)pyrene quinones are 0.3 micrograms/ml and 0.5 micrograms/ml, respectively. The prague atmosphere contains only trace amounts of benzo(a)pyrene quinones and does not contain detectable amounts of pyrene quinones. (Author summary)

14370 APTIC NO. 32112

Jepsen, Anders F.

CORRELATION SPECTROSCOPY AND ITS APPLICATIONS TO REMOTE SENSING OF AMBIENT AIR QUALITY. *Preprint, Inst. of Electrical and Electronics Engineers, San Francisco, Calif. and Western Electronic Manufacturers Assoc., Los Angeles, Calif., 6p., 1971. (Presented at the Western Electronic Show Convention, San Francisco, Calif., Aug. 24-27, 1971, Paper 32/3.)*

The Barringer correlation spectrometer is an accurate, rugged, and rapid response gas analyzer. Its special characteristics permit the precise mapping of air pollution over an area and the exact real time measurement of ambient gas levels at a single point. Because it operates on physical principles, maintenance problems are minimal. Since it is a remote sensor, it can detect clouds of gas far from the site of point monitors. The Beer-Lambert Law of Absorption is fundamental to correlation spectroscopy. Light radiating through the atmosphere is absorbed by various molecules at very specific wavelengths; specific absorption lines characteristic of those molecules are developed on the light. Correlation spectroscopy relies on a mechanical means for determining the cross-correlation function between a mask containing openings for the absorption lines for a specific molecule and the spectra containing these lines. In prototype versions of the Barringer correlation spectrometer, the slits on the mask and the amount of the offset were designed to provide the optimum response for the specific molecule under study. The optics and dual sensor configuration of the spectrometer permit the monitoring of two gas concentrations simultaneously. Various applications of remote sensing to the quantitative measurement of ambient air quality are described. The spectrometer can also be used for air pollution mapping. (Author conclusions modified)

14371 APTIC NO. 32100

Kamiyama, Horoaki, Toshi Tomizawa, and Teruo Yatabe

COMPREHENSIVE EVALUATION OF ATMOSPHERIC SULFUR OXIDE MEASUREMENT METHODS. *(Taiki chu no iwo sankabutsu sokuteiho ni kansuru sogoteki hyoka). Text in Japanese. Karyoku Hatsuden (Thermoelectric Power Generation), 22(3):265-275, March 1971. 11 refs.*

The AP Meter (an automatic conductivity analyzer/recorder) is specified as the permanent monitoring device for atmospheric sulfur oxides (sulfur dioxide and sulfur trioxide) under the Environmental Standards. It does not always yield values agreeing with those obtained by other methods. To clarify this point, analyses were made of pollutants in the atmosphere, pollutants in the absorbent solution of the AP Meter, and problems involving proper use of the measuring instrument. The mass spectrometric method, having no relationship with the AP Meter and Rosaniline methods, was used to detect pollutant gases in the atmosphere, to examine the reliability of the other two methods, and to detect pollutants other than SO2. The low temperature concentration method using liquefied oxygen was used for the quantitative analysis of atmospheric SO2, whose density is usually very low. A chemical analysis of the AP Meter s absorbent solution clarified its component substances to determine if the atmospheric pollutants could be transformed into electroconductive substances when absorbed by the solution. An experimental device prepared a large quantity of accurate standard gas and determined the bias and variation errors of the AP Meter and Rosaniline methods. Following laboratory experiments, field tests were conducted. Generally, the values indicated by the AP Meter were higher than those indicated by the Rosaniline method. This was not due to other pollutant gases, but to evaporation loss of the absorbent solution. This trend was greater when temperature, humidity, and SO2 density were lower. Thus, the AP Meter tends to indicate values higher than the actual value in winter, when temperature and humidity are low. With corrections for these factors, the AP Meter values differ by 10% or less from those obtained by the Rosaniline method. No gaseous pollutant notably affected the AP Meter s values. Nitrogen oxides of a few hundred ppb or less hardly affected the AP Meter. When ammonia was present in the atmosphere, AP Meter values were on the negative side. Salt caused an 0.01 ppm difference in the meter.

14372 APTIC NO. 32478

Kashiki, Masayuki and Shozo Oshima

ABSORPTION PHOTOMETRIC DETERMINATION BY SODIUM CHROMATE OF SULFIDE AND BISULFIDE IN NAPHTHA FRACTION. *(Kuromusan natryumu ni yoru sekiyu nafusa ryubun chu no surufido oyobi jisurufido no kyuko kodo teiryo). Text in Japanese. Maruzen Sekiyu Giho (Maruzen Oil Tech. Rept.), no. 15:85-88, Dec. 1970. 9 refs.*

Ways to determine sulfides and bisulfides in naphtha fractions by absorption photometric analysis were studied. Sulfide or bisulfide combined with sodium chromate in a sulfuric acid solvent forms a complex compound. The complex compound is bluish green and gives the highest absorbance when the solvent is of concentrated sulfuric acid and water mixed at the ratio of nine to one. Maximum absorbance is indicated at 465, 680 and 720 micron. It is possible to determine sulfides and bisulfides in naphtha by absorption photometric analysis. For quantitative analysis, 5.0 ml of 90 vol% sulfuric acid solution with sodium chromate adjusted to 0.2 mol and 10 ml of the sample are put in a 25-ml separator funnel and shaken for at least 60 sec. The sulfuric acid layer (the lower layer) is then transferred into a 25 ml female flask. About seven ml of the sulfuric acid solution is put into the funnel, shaken for 60 sec, and the lower layer transferred into the female flask. Another seven ml of the sulfuric acid solution is put into the funnel again and the lower layer transferred into the flask. The solution is then diluted by the 90 vol% sulfuric acid solution to the calibrated mark. This sample is placed in a 35-50 C bath until completely colored. After 30 min, it is measured with a one cm glass cell at 720 mu for the absorbance, referring to that obtained by the blank test.

14373 APTIC NO. 32001

Kerenyi, I. and M. L. Lowry

PULSED LIDAR DESIGN CHART SYSTEM FOR REMOTE DETECTION OF AEROSOL PARTICLE CONCENTRATIONS IN THE ATMOSPHERE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 38p., 1971. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-4.)*

A logarithmic chart system is presented which serves as an aid for the lidar system designer in optimizing system parameters and as a general guide to the user in understanding trade-offs between various system parameters. The system permits easy evaluation of received energy and signal to noise formulae. Each chart shows a specific formula and a combined logarithmic and linear dB scale for each parameter appearing in the formula. On the charts the scales are laid over a straight arrowed line at the parameter values which were assumed or calculated using the formulae. The parameters are grouped according to their indices showing their relative influence on the received signals and on signal to noise ratios. Procedures for using the system are described.

14374 APTIC NO. 32101

Kinomoto, Toshio

AUTOMATIC MEASUREMENT METHOD OF OXIDANT. *(Oxidant no jido sokuteiho). Text in Japanese. Bunseki Kiki (Analysis Instr.), 9(8):31-36, Aug. 1971.*

The potassium iodine method, presently applied to measure oxidants in the air, is divided into the colorimetric method and the wet chemical method. The wet chemical method uses activated coal as the electrode; the absorbing liquid circulates, which necessitates changing the activated coal. However, the method is cheap, simple, and reliable. In the presence of sulfur dioxide, iodine, which has been isolated by ozone, reverts to its original status, and the oxidant appears as zero. Therefore, SO2 must be oxidized to sulfur trioxide using trioxide chrome paper for an accurate measure of oxidants. Measuring equipment using absorption of ultraviolet or infrared rays by ozone have been developed. These are very sensitive and avoid the effect of humidity on silica gel, so it is possible to measure oxidants in highly humid and dusty areas. Thus, spectrometry is the most advanced method for measuring ozone or oxidant. An automatic measuring instrument for peroxyacetyl nitrate is now in operation at the University of California. More instruments will be developed in the future. Since peroxyacetyl nitrate is less than one tenth the amount of ozone, the measurement of ozone is usually used for the measurement of the oxidant.

14375 APTIC NO. 32208

Kolar, Joergen

THE ABSORPTION OF HUMIDITY BY DRIED FILTER FABRICS IN GRAVIMETRIC DUST CONTENT DETERMINATION. *(Untersuchungen ueber die Feuchtigkeitsaufnahme getrockneter Filterstoffe, die bei der gravimetrischen Staubgehaltsbestimmung verwendet werden. Text in German. Waerme, 73(4):118-119, Dec. 1967. 2 refs.*

In the gravimetric determination of dust retained by a filter fabric, errors resulting from the absorption of humidity by the filter are eliminated by drying the filter before and following sampling in a dessicator at 105 C. If the time required for the weighing of the dust sample is too long or if humidity before and following sampling varies, then an error can result which can amount to 19%, in the case of very small samples. The larger the sample the smaller the error from this source. If a large sample cannot be collected, then weighing should take place in a room with low controlled humidity. If that is not possible, then to avoid the error it is essential that the time required for the first and second weighing of the filter be exactly the same or else that a correction be made for the absorption of humidity by the filter and the dust sample. A diagram is used for this with one coordinate indicating relative humidity and the other the absorption of humidity/sec.

14376 APTIC NO. 32299

Kothny, Evaldo L. and Peter K. Mueller

FASTER ANALYSES OF NITROGEN DIOXIDE WITH CONTINUOUS AIR ANALYZERS. *Instrument Society of America, Pittsburgh, Pa., Proc. Symp. Air Pollution Instrumentation, Los Angeles, Calif., 1965, p. 61-74. 7 refs. (Oct. 5.)*

The nitrogen dioxide recording systems now in use for atmospheric monitoring are based on reaction of this gas with a suitable azo-dye forming reagent. The effect of various chemical and physical variables on the response of a nitrite reagent is described. For performance comparison, an empirical parameter was developed and applied; optimization rules were also derived and applied. Laboratory testing equipment and gas dilution apparatus were used, in addition to a Beckman DB, a Cary Model II, and a Perkin Elmer IR 21 spectrophotometer. In order to compare a variety of different reagent formulations, both the speed of color formation and the maximum absorbance produced by a given amount of nitrite were considered. A sub-minute response reagent was developed containing N,N(1-naphthyl, acetyl) ethylene diamine, 2-amino-p-benzenedisulfonic acid, and sulfuric acid. Designs of gas-liquid contact and optical systems were evaluated to match fast response reagents. (Author abstract modified)

14377 APTIC NO. 31952

Kubota, Isao and Kenji Hamada

ON THE CORRELATION BETWEEN BOSCH SMOKE VALUE AND CARBON PARTICLES PASSING THROUGH FILTER PAPER. *(Bosshu haiki nodo to roshi tokaritsu no kankei ni tsuite). Text in Japanese. Kure Kogyo Koto Senmon Gakko Kenkyu Hokoku (Mem. Kure Tech. Coll.), 6(1):17-23, Oct. 1970. 1 ref.*

The accuracy with which the Bosch smoke gauge measures carbon dust in diesel engine exhaust was studied by determining the percentage of total carbon particulates passing through filter paper. A muffler was fitted to the exhaust pipe of a precombustion-type diesel engine, and a sampler with five sheets of standard Bosch smoke gauge filter paper was inserted in the exhaust pipe after the muffler. The carbon particulates were stopped by the five filters (which overlapped one another), and the concentration measured for each paper. The percentage calculated from the correlation between the Bosch smoke value estimated on the assumption that there is no overlapping of carbon particulates and the Bosch smoke value assuming the overlapping of carbon particulates, showed that about 40-45% of carbon particulates were arrested by the first sheet of filter paper and that more particulates passed through the filter paper at lighter loads. To find the correlation between thickness of filter paper and smoke density, the number of overlapping filter papers was changed. The test indicated that smoke density value was no longer affected when the number of filter papers was three or more. Use of one sheet of the standard filter paper, as is currently practiced, is thus unreasonable from the viewpoint of accuracy. If one filter is used at a time, the paper should be one millimeter thick. In this case, about 85-90% of carbon particulates are arrested.

14378 APTIC NO. 32140

Low, Manfred J. D.

MULTIPLE-SCAN INFRARED INTERFERENCE SPECTROSCOPY. *J. Chem. Educ., 43(12):637-643, Dec. 1966. 17 refs.*

Some of the limitations imposed on conventional dispersion spectrometers can be overcome by using a scanning interferometer. The advantages afforded by this are that the narrow entrance slits required by dispersion instruments are not needed, so that the light-gathering capability of the interferometer spectrometer is much greater than that of a dispersion spectrometer, and all of the radiation components are incident on the detector simultaneously and are observed throughout the entire operation cycle. A block diagram of a multiple-scan Michaelson interference spectrometer was shown. The optical system is not a monochromator, but a device to perform an optical transformation. Digital computer reduction or analog analysis of the interferogram is possible. The interferogram also can be analyzed by means of a slow scanning wave analyzer. A Coadder acts as a coherent addition and data-storage device. Instrument characteristics were considered. A multiple-scanning interferometer is rather complicated and its cost is relatively high. It is priced at approximately $27,500 (1966). Infrared spectral emission and infrared absorption spectra were discussed. It was concluded that interferometry offers a valuable approach to difficult infrared spectral measurements as shown by various applications in the fingerprint region and in the far infrared.

14379 APTIC NO. 32297

Lyons, Stephen

INSTRUMENTATION ENGINEERING FOR AN AIR POLLUTION LABORATORY. *Instrument Society of America, Pittsburgh, Pa., Proc. Symp. Air Pollution Instrumentation, Los Angeles, Calif., 1965, p. 56-61. (Oct. 5.)*

Instrumentation engineering and maintenance problems concerning photometric and other analytical apparatus used in an air pollution laboratory for research on pollutants and sources are considered. Emphasis is on problems reflecting the methods of implementation rather than the physical or chemical principles used. Contamination of gas analyzers by auto exhaust is mentioned, as well as instrumentation for a survey of driver habits. Function and organization of the instrument engineering group is discussed. (Author abstract modified)

14380 APTIC NO. 32300

MacCready, Paul B., Jr.

INSTRUMENTATION REQUIREMENTS FOR METEOROLOGICAL RESEARCH. *Instrument Society of America, Pittsburgh, Pa., Proc. Symp. Air Pollution Instrumentation, Los Angeles, Calif., 1965, p. 4-7. (Oct. 5.)*

Conventional and advanced methods of measuring meteorological parameters and the problems involved are cited. Wind speed is measured with the rotating cup anemometer and wind direction with the direction vane. There are a variety of ways of measuring temperature, radiation, humidity and whatever other point variables are of interest. These can be turned into motion of the stylus or electrical signals recorded on, for example, an Esterline Angus recorder. Probably the most important factor in the present advanced methods is the use of automatic weather stations where the data are recorded in some digital form. The most fundamental meteorological variable in air pollution work is the wind velocity field, and measurement methods for its two components of mean wind flow and turbulence are mentioned. Methods for making measurements above ground level are indicated, including balloon techniques, tracers, airborne sensors, and radar. Future prospects, such as lidar, are mentioned.

14381 APTIC NO. 32295

Maga, John A.

INSTRUMENTATION REQUIREMENTS FOR AUTOMOTIVE EMISSIONS. *Instrument Society of America, Pittsburgh, Pa., Proc. Symp. Air Pollution Instrumentation, Los Angeles, Calif., 1965, p. 13-15. (Oct. 5.)*

Motor vehicle emissions are determined by the kinds of pollutants emitted and by the operating conditions of the vehicle. Hydrocarbons, carbon monoxide, carbon dioxide, and oxides of nitrogen are the compounds commonly measured. There are a number of sampling possibilities, including proportional samplers to collect an exhaust sample on the road, continuous sampling, and a bag sample which collects all the exhaust emissions over a test cycle in the laboratory. The type of sample collected, to a large extent, determines the method of analysis. Another factor determining instrument needs is the ultimate use of the data. Instrumentation for inspection and enforcement is also needed.

14382 APTIC NO. 31862

Malenfant, Arthur L., Stanley B. Smith, and Jae Y. Hwang

MERCURY POLLUTION MONITORING BY ATOMIC ABSORPTION UTILIZING A GAS CELL TECHNIQUE. *Preprint, 8p., 1970. 11 refs. (Presented at the Eastern Analytical Symposium, 12th, Annual, Nov. 19, 1970.)*

The determination of mercury in fish, urine, and air samples by atomic absorption is reviewed. The system design, procedure, and typical results are presented. The methods provide for the aeration, or evolution, of all the mercury contained in the original samples at the appropriate time. Only 2 manograms of mercury were required for 1% absorption at the peak height (0.0044 Abs). Interference in the methods centered around the presence of other easily reducible substances; selenium, as well as silver, gold, platinum, and palladium gave low results. The working curve of mercury was linear over several orders of magnitude in concentration. Under the conditions established, sensitivity was unaffected by sample volume as long as total volume was less than 10 12 ml. The technique used was open- ended. To shorten analysis time, the mercury was reduced and then passed into the absorption cell. A reasonably constant flow rate of the gas through the absorption cell was necessary to permit the profile of the mercury sample to reproduce. When the flow rate was too slow, the peak was broadened by diffusion; when it was too high, the sample was flushed through the absorption cell too rapidly for proper response and sensitivity was lost. Recovery experiments were performed to test the accuracy of the methods.

14383 APTIC NO. 31752

Margolis, Geoffrey and J. N. Driscoll

CRITICAL EVALUATION OF THE RATE CONTROLLING PROCESSES IN MANUAL METHODS FOR NOX ANALYSIS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1971. 18 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-147.)*

A critical evaluation of absorption and oxidation rates for nitrogen oxides was conducted in an effort to reduce the overnight standing time required for manual nitrogen oxide methods. Theoretical results indicate that the rate controlling step was the gas phase oxidation of nitric acid to a species which is more easily absorbed. This was verified by the experimental studies conducted. Strategies based on increasing oxidation rates of nitric oxide and, therefore, reducing the analysis time are discussed, as well as techniques for reducing the time (absorption and analysis) determination of total nitrogen oxides to less than three hours. (Author abstract modified)

14384 APTIC NO. 32448

Masek, Vaclay

THE COMMON DETERMINATION OF ACROLEIN AND FORMALDEHYDE IN THE AIR. *(Zur gemeinsamen Bestimmung von Acrolein und Formaldehyd in der Luft). Text in German. Gesundh. Ingr., 92(8):245-246, Aug. 1971. 6 refs.*

Acrolein in the air was determined by a spectrophotometric method. The air sample was passed at a rate of 2 l/min through two subsequent scrubbers, each containing 10 ml ethyl alcohol. The solutions of the two scrubbers were then combined and prepared for photometric acrolein determination at 605 nm. For the determination of formaldehyde, the air was sampled at a rate of 2.3-2.6 l/min and drawn through an absorption vessel filled with 25 ml distilled water. A mixture of sodium sulfite, mercuric choloride, and sodium chloride was added to 20 ml of the absorption solution plus 2 ml fuchsin solution in concentrated hydrochloric acid. The intensity of the red color was measured at 570 nm. For the determination of mixtures of aliphatic aldehydes, air was drawn at a rate of 0.5 l/min through a scrubber containing 35 ml of a 0.05% aqueous solution. An oxidation agent was added and after 12 min, the extinction was measured at 628 nm. The accuracy of the results depended on the analytical method and on the quality and quantity ratio between acrolein and formaldehyde.

14385 APTIC NO. 31975

Mason, Hermann C.

SAMPLER AND INCUBATOR FOR VIABLE AND NON-VIABLE AIRBORNE PARTICLES. *(Assignee not given.) U. S. Pat. 3,576,721. 6p., April 27, 1971. 3 refs. (Appl. Aug. 26, 1968, 11 claims).*

A combination sampler and incubator is discussed, suitable for determining the extent and nature of environmental contamination, both viable and nonviable, through the deposition and subsequent examination of the airborne particulates. A cover carrying the heating and humidifying elements necessary for incubation is attached to the intake opening, and the container is inverted. Air purity is a matter of concern in a number of environments, such as the nurseries, wards, and operating rooms of hospitals, pharmaceutical manufacturing areas, and army camps and first aid quarters.

14386 APTIC NO. 32310

Mason, Martin T.

THE QUADRUPOLE MASS SPECTROMETER AND SOME RECENT APPLICATIONS. *In: Modern Aspects of Mass Spectrometry. Rowland I. Reed (ed.), New York, Plenum Press, 1968, p. 61-83. 9 refs. (Presented at the NATO Advanced Study Institute of Mass Spectrometry on Theory, Design, and Applications, 2nd, Glasgow, Scotland, July 1966.)*

The quadrupole mass filter produces an electric field through which ions are passed. When a substance is placed in a quadrupole mass analyzer, ions are produced, filtered, collected by the ion dectector, and the mass is determined. Mathematical analysis of the potential of the electrostatic field, the motion of a singly charged ion, trajectory characteristics, stability, and mass are given. Several types of ionizers are described. The quadrupole section is composed of four stainless steel rods attached to alumina insulators. Also, an RF/DC generator supplies the RF and DC voltages to the poles and regulates the ratio of the voltages to the desired level. A Faraday cup or electron multiplier collects the ions at the end of the quadrupole. Resolutions of approximately 200 have been obtained from this spectrometer. Sensitivity can be enhanced by decreasing the scanning frequency and noise filtering. With a scan time of 50 msec, partial pressures of 10 to the minus 11 power torr are readily observed on a good oscilloscope. The quadrupole mass spectrometer can be used as a residual gas analyzer for high and ultrahigh vacuum systems, chemical kinetics and surface chemistry studies, gas chromatography, the study of free radicals, and ion-neutral collision investigations. A quadrupole mass spectrometer was used to test the exhaust from two cars. The complete engine combustion represents the conversion of all hydrocarbons to carbon dioxide and water. The relative engine efficiency was determined by plotting the ratio of (carbon dioxide + water)/hydrocarbons. The catalytic decomposition of hydrazine on platinum was also studied.

14387 APTIC NO. 32156

Masson, C. R.

STABLE ISOTOPE-DILUTION TECHNIQUES FOR THE DETERMINATION OF GASES IN METALS. *Metals, Mater., 1(10):147-168, Oct. 1967. 50 refs.*

The isotope-dilution technique can be used to analyze oxygen, nitrogen, and hydrogen in metals. A specimen containing the element under analysis is equilibrated with a measured quantity of a tracer of the same element whose isotopic composition differs from the normal. Then the isotopic composition is measured after equilibration to give the original amount of the element. This method has the advantages of: high sensitivity; quantitative extraction is unnecessary; calibration with standards is unnecessary; the measurement is specific; and the isotopes are non-radioactive. The main disadvantages are: the method is time consuming; a mass spectrometer is needed; and isotopes are expensive. The apparatus, calibration, temperature, crucible type, and reactions used for oxygen analysis are described. Mass spectrometry is used for the determination of isotopic ratios. Three methods have been used to determine nitrogen in metals by isotopic dilution: a chemical procedure in which the specimen is dissolved in acid in the presence of a measured amount of an ammonium salt enriched in N isotope 15; equilibration of the fused specimen with enriched nitrogen at a high temperature; and equilibration of the solid specimen with enriched nitrogen at a high temperature. Hydrogen has been determined by isotopic balancing with deuterium. Also, the hydrogen content of sodium and sodium-potassium alloy has been determined. Hydrogen can also be determined with tritium. A comparison of the isotope-dilution method with other analytical methods is given for hydrogen, nitrogen, and oxygen. Sources of error, limits of detection, the choice of the optimum quantity of tracer, precision, and accuracy are also discussed in detail. Future developments may lead to reduction in the analysis time, the determination of two or more elements simultaneously, the use of gas chromatography to determine isotopic ratios, and many other improvements.

14388 APTIC NO. 32097

Matsuoka, Cho, Toshio Kitamura, and Isao Tahara

INFLUENCES OF HYDROGEN SULFIDE ON SULFUR DIOXIDE VALUES BY LEAD DIOXIDE METHOD. *(H2S no sonzai gas Pb02-entoho S02chi ni ataeru eikyo). Text in Japanese. Tokushima-ken Eisei Kenkyusho Nenpo (Ann. Rept. Tokushima Pref. Inst. Public Health), no. 10:41-43, 1971. 2 refs.*

As determined by the lead dioxide method, atmospheric sulfur dioxide in the vicinity of viscose rayon factories in the eastern, coastal area of Tikushima Prefecture was 0.97 mg S03/day/100 sq cm. This was higher than the mean at other sites, 0.28 mg S03/day/100 sq cm. Therefore, the effects of hydrogen sulfide emissions from the factories on Pb02 measurements was investigated. Experiments were performed at 31 deg, 69% humidity, and a flow rate of 0.6 m/sec. Mean H2S concentration was 1.5 ppm. The mean S02 value for three experiments was 27 mg S03/day/100 sq cm. As 24-28 hours were allowed for the experiments, it is unlikely that PbS produced by the reaction of Pb02 with H2S would be oxidized by air. Apparently, digestion in hot water with addition of Na2C03 solution for colorimetry leads to the reaction of PbS + 4 Pb02 yields PbS04 + H20. The high S02 values are the result of the PbS04.

14389 APTIC NO. 32376

McKinley, J. J.

A CALIBRATION SYSTEM FOR TRACE ANALYZERS. *Anal. Instrum., vol. 8:1-5, 1970. (Presented at the Instrumentation Society of America, Analysis Instrumentation Symposium, Annual, 16th, Pittsburgh, Pa., May 25-27, 1970, Paper 3-1.)*

The construction and operation of a new calibration system for trace analyzers was described. The system uses molecular permeation through a plastic membrane to generate precise synthetic mixtures. Membrane temperature, gas pressure, and diluent flow rate can be varied to provide a wide range of concentrations and flow volumes. The system can be used with a wide variety of gases and many condensable vapors. The device may be used as a simple, single point calibrator for on-stream analyzers, or it may be used as a more elaborate multi-purpose lab standard. It is well suited for use as a portable primary standard for field inspection and service. By choosing suitable membrane materials, this system can be used to produce mixtures from the one percent level down to a few parts-per- hundred-billion.

14390 APTIC NO. 31827

McLean, W. J. and R. F. Sawyer

CHEMICAL KINETICS IN FREE JET EXPANSIONS. *Preprint, Combustion Institute, Western States Section,* *20p., 1970. 8 refs. (Presented at the Combustion Institute Western States Section, Spring Meeting, Berkeley, Calif., April 20-21, 1970, Paper WSCI-70-12.)*

In molecular beam sampling systems such as mass spectrometry, which use a free jet expansion to expand the sample from high source temperatures and pressures to low temperatures and pressures, the chemical kinetics in the free jet determines the integrity of the sample. In the present study, Sherman s equations which are used to compute the temperature and pressure profiles in the expansion of the chemical kinetic equations for several systems, are integrated over these profiles to determine the amount of quenching a sample will experience. For the molecular hydrogen -- atomic hydrogen system at a source temperature of 3000 K, the degree of H atom recombination in a free jet expansion from equilibrium conditions was investigated for source pressures from 0.5 to 100 atmospheres and orifice diameters from 0.05 to 2.5 cm. For the molecular hydrogen -- molecular fluorine system at 100 psia source pressure and adiabatic flame temperature, the reaction in a free jet expansion was computed for orifice diameters from 0.05 to 2.5 cm and equivalence ratios of 1.0 and 2.0. (Author summary modified)

14391 APTIC NO. 32179

Mercer, T. T., C. M. Mills, and A. R. Gibb

COLLECTION EFFICIENCIES OF A CASCADE FILTRATION DEVICE EMPLOYING WIRE GAUZES. *Ann. Occupational Hyg., vol. 1:301-313, 1960. 6 refs.*

Evaluation of the performance of a cascade filtration air sampler comprised determination of (a) the gross collection efficiences of each of the first two stages when used at various flow rates to sample aerosols of uranium dioxide and sodium chloride, and (b) the collection efficiency, as a function of particle size, for each of the first two stages when used in sampling an aerosol at 15 liters per minute. The device is essentially a lucite tube arranged to hold three filtering media in series. In the range of particle sizes studied, it did not provide sufficient data to permit estimation of the mass distribution of the sampled aerosol.

14392 APTIC NO. 32174

Morris, E. J., H. M. Darlow, J. F. H. Peel, and W. C. Wright

THE QUANTITATIVE ASSAY OF MONO-DISPERSED AEROSOLS OF BACTERIA AND BACTERIOPHAGE BY ELECTROSTATIC PRECIPITATION. *J. Hyg., 59(4):487-496, 1961. 9 refs.*

Three tubular electrostatic precipitators are described for the assay of bacterial and bacteriophage aerosols. Particles can be sampled directly on agar or on agar-impregnated paper in a wide range of aerosol concentrations, or sampled into a fluid for the assay of airborne microorganisms. The collection efficiency of the electrostatic precipitator on agar was determined by sampling a Bacillus globigii spore aerosol before and after passage through the sampler. Rapid consective sampling is possible with the samplers and a collection efficiency approaching 100% is readily obtained. Effects of humidity and ozone are noted. (Author summary modified)

14393 APTIC NO. 31979

Mutho, M., H. R. Gundo Rao, and S. K. Majumder

A BIO-ASSAY METHOD FOR DETERMINING FUMIGANT CONCENTRATIONS IN AIR. *Int. Pest Contr., 13(4):11-14, July/Aug. 1971. 7 refs.*

A bio-assay method for determining fumigant concentrations in air is described. The method is based on passing aspirating fumigant samples through U-tubes containing insects, noting the time taken for 100% knock-down, and using the time as the denominator to divide the concentration-time product value. The result gives the approximate concentration of the fumigant. Concentration-time products producing 100% knock-down of Tribolium castaneum (Herbst) were determined for 10 fumigants, after which the bio-assay method was compared with chemical analysis in field trials. Fumigants measured in the field trials were methyl bromide, ethylene oxide, and phosphine. Concentrations obtained by the bio-assay method showed a close similarity with the results of the chemical analysis.

14394 APTIC NO. 32452

Nikiforova, N. K. and Yu. S. Sedunov.

ON THE DISTORTION OF SIZE DISTRIBUTION OF AEROSOL PARTICLES CAUSED BY NONUNIFORMITY OF THE LIGHT FIELD IN PHOTOELECTRIC DETECTORS. *(Iskazheniya raspredeleniya chastits aerozoley po razmeram za schet neravnomernosti svetovogo polya fotoelektricheskikh datchikov). Text in Russian. Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana, 7(1):92-7, 1971. 8 refs.*

The errors of photoelectric instruments for the determination of concentration and size distribution of aerosols were caused by the nonuniformity of the light field in a counter volume of the device. The parameter one of the instrument was introduced into the calculation which characterizes uniformity of a light field in the instrument. The distortion function, equal to the ratio of instrumental and actual spectra, was calculated for various values of the parameter one and of the parameters of distribution according to particle size, which were approximated by gamma distribution. The distortion in size distribution, determined by the Aelita instruments was evaluated. When reasonable choice of calibration is made, this distortion is negligible.

14395 APTIC NO. 32486

Nill, K. W., F. A. Blum, A. R. Calawa, and T. C. Harman

INFRARED SPECTROSCOPY OF CO USING A TUNABLE PBSSE DIODE LASER. *Appl. Phys. Letters, 19(4):79-82, Aug. 15, 1971. 16 refs.*

High-resolution tunable-laser studies in the infrared of the molecular adsorption bands of atmospheric pollutants such as carbon monoxide show promise of yielding valuable sensitive techniques for their detection. A cw tunable lead-sulfur-selenium diode laser operating at 4.75 micrometers was used to study the P(9) fundamental adsorption of CO gas at pressures between 0.03 and 1.0 torr. At a diode current of 445 mA, approximately twice the threshold, the laser output was predominantly in a single mode with an estimated linewidth of one MHz. This mode tuned with diode current (due to heating) at a rate of 250 MHz/mA with a continuous tuning range of approximately 30 GHz. The estimated laser linewidth was about 0.01 of the Doppler width of the CO absorption line studied and was tunable over a range about 200 times the absorption linewidth. The cw diodes were fabricated from PbS(sub 0.82) Se(sub 0.18) single crystals whose composition was chosen to match the CO absorption band near 4.7 micron.

14396 APTIC NO. 32474

Omang, Sverre H.

THE DETERMINATION OF LEAD IN AIR BY FLAMELESS ATOMIC ABSORPTION SPECTROPHOTOMETRY. *Anal. Chim. Acta, 55(2):439-441, July 1971. 12 refs.*

The use of flameless atomic absorption spectrophotometry is described in a simple, rapid, and extremely sensitive method, combined with the collection of lead particulates on millipore filters from air volumes down to 10 cu dm. Air contaminants were collected on 37-mm diameter MF-millipore filters AA (0.8 micron), made of mixed cellulose esters; these filters were connected to a small portable battery-operated pump, calibrated to 2.7 cu dm air/min. A Perkin-Elmer Model 303 atomic absorption spectrophotometer equipped with a Perkin-Elmer graphite cell HGA 70, an automatic recorder readout accessory, and a Hitachi-Perkin-Elmer Recorder Model 159 were used. Two separate heat treatment stages, drying and charring, are used to remove any solvent, organic material, or other unwanted components before sample volumes are atomized in the graphite tube. Lead samples are collected by aspirating air for 10 min through the millipore filters. The filters are then soaked in 2.0 ml of one plus one nitric acid in a 50 ml beaker and gentle heat is applied. After five minutes, this is decanted into a 10 ml volumetric flask and the filters are washed with successive two ml portions of warm distilled water. Then they are diluted to volume with distilled water and five to 50 ml of 0.1 ppm lead standard solution is injected into the graphite tube. The lead absorption peak is registered at program four with a five V atomization voltage and a 30 sec sequence time. Problems with light scattering are mentioned. The proposed method was used in the analysis of a number of air particulate samples collected in Oslo in November 1970, one m above street level.

14397 APTIC NO. 32450

Panin, K. P.

SEPARATE DETERMINATION OF INORGANIC FLUORINE GASEOUS COMPOUNDS AND WATER SOLUBLE AEROSOLS IN THE ATMOSPHERE. *(Razdel noye opredeleniye neorganicheskikh gazoobraznykh soedineniy ftora i aerozoley, rastvorennykh v vode, v atmosfernom vozdukhe). Text in Russian. Gigiena i Sanit., 36(6):58-61, 1971. 3 refs.*

Analyzed air was filtered through a material (acetyl celluloid filter AFA-KhA) on which only aerosols (solid fluorine compounds) were collected. These were subsequently washed off the filter with water of varying temperatures. The gaseous compounds were collected in an absorber. Fluorine ions in both the aerosol and gaseous phase were determined by the reaction with a titanchromatrope reagent. Fluorine compounds, poorly soluble in water, were washed off the filter with hot water. In the testing, 96-99% of fluorine substances soluble in water at room temperature were recovered from the filter. The sensitivity of the method is two micrograms of fluorine ions per five ml of solution. The effect of other ions on the determination was studied.

14398 APTIC NO. 32027

Paterson, J. A., M. W. McElroy, R. F. Sawyer, and T. Singh

A PROTOTYPE CHEMILUMINESCENT NO ANALYZER. *Caliornia Univ., Berkeley, Thermal Systems Div., National Air Pollution Control Administration Res. Grant AP-00385, Rept. TS-70-9, 39p., Sept. 1970. 17 refs.*

The design, construction, and calibration of a prototype nitric oxide analyzer based on the chemiluminescence from the reaction of NO with ozone is examined. Nitric oxide concentrations of 0.2 to at least 100 ppm were continuously measured with 5% accuracy. Measurement was not affected by other hydrocarbon combustion products when present in typical exhaust concentrations. The NO analyzer was used to measure NO concentrations in the exhaust from two experimental methane-air combustors. Results of the measurements are discussed. Details of construction and operation and recommendations for further development are included. (Autho abstract modified)

14399 APTIC NO. 31739

Peregud, E. A. and E. M. Stepanenko

NEW METHODS FOR THE DETERMINATION OF VERY SMALL AMOUNTS OF OZONE. *Zh. Anal. Khim. (Moscow), 15(1):96-98, 1960. 10 refs. Translated from Russian. Associated Technical Services, Inc., Glen Ridge, N. J., 4p.*

Highly sensitive quantitative methods for ozone determination have been developed, based on fluorescence extinction and color change of indicator tubes when air containing very small amounts of ozone is drawn through them. Of a number of proposed indicators, the most sensitive to ozone while being very inert to oxides of nitrogen is a luminol-based indicator. To prepare the indicator powder, 0.025 g of luminol is dissolved in a volumetric flask in 25 ml of 0.1 N sodium hydroxide and the volume increased to 100 ml with distilled water. One ml of this solution is transferred into a volumetric flask and increased to 100 ml volume with water. For impregnating one g of silica gel, two ml of the diluted luminol solution is used. After careful mixing, the treated silica gel is dried for one hour at 100 deg.

14400 APTIC NO. 32022

Purdom, Paul Walton

SOURCE MONITORING. *In: Air Pollution. Arthur C. Stern (ed.), Vol. 3, 2nd ed., New York, Academic Press, 1968, Chapt. 29, p. 537-560. 54 refs.*

Source monitoring is used to control processes which may cause air pollution and may be supplemented by monitoring individual processes and raw materials. Systems for determining stack emissions include the Ringelmann Smoke Chart, transmissometers, and human observations. Organoleptic methods can be used to determine odors. Automatic monitoring for particulates and gases includes electrometric, photometric, ionization, chromatographic, conductimetric, and spectrographic methods. In the past, the greatest attention has been to combustion processes. Various control agencies use source monitoring to ensure compliance with legal emission standards. Plant managements also use it to alert personnel to operating difficulties so that corrective action can be taken quickly, and to provide a record for defense for the plant where emissions are carefully controlled within allowed limits. In the future, control agencies may require plants to maintain source monitoring systems and report data to the control agency. While such efforts may raise legal questions, the principle has had wide application in the fields of waste water treatment, water purification, and milk pasteurization.

14401 APTIC NO. 32106

Saitoh, Takeshi

MEASUREMENT AND ESTIMATION OF EXHAUST GAS VOLUME OF AUTOMOBILE ENGINES. *(Jidosha no haiki hasuryo no sokutei to suitei). Text in Japanese. Waseda Daigaku Rikogaku Kenkyusho Hokoku (Bull. Sci. Eng. Res. Lab., Wasdea Univ.), no. 52:46-54, June 1971. 4 refs.*

Automotive exhaust gas volume of a test engine during steady and accelerating operations was measured with various flowmeters (orifice, pitot tube, hotwire, and laminar) to determine the most practical measuring method. Also evaluated were two indirect measurement methods -- calculation of the volume from fuel consumption and calculation from boost pressure and engine speed. Since automobile exhaust gas emissions pulsate, fluctuate widely in volume, and contain water and soot, measurement is not an easy task. Correlations among various factors of a particular type of automobile engine obtained by any of the investigated methods are not readily applicable to another type of engine unless properly corrected or modified for by the actual test for absolute volume of exhaust gas from an engine of the same type and size. Although a gas holder can be used for measurement of the absolute volume of exhaust gas, a surge tank may be used instead to smooth out the pulsation. The volume is then measured by an orifice or nozzle of known value for verification. Any of the five methods measures the volume with an accuracy of plus or minus 10%. With a differential pressure converter for recording pressure changes during the acceleration, the volume of exhaust gas during the acceleration can be indirectly measured from the results of a steady-speed operation. Of the direct measurement methods, the orific method is the most practical and accurate. The hot-wire flowmeter is easy to use but gives lower accuracy. The Pitot tube has a problem in the low volume range, while the laminar flowmeter is hard to use for the exhaust gas.

The method in which exhaust gas volume is calculated from the boost pressure and engine speed is comparatively accurate and applicable to measuring exhaust gas volume during acceleration.

14402 APTIC NO. 31884

Samuilov, Viktor Ivanovich, Jury Markovich Genkins, and Maria Dmitrievna Suvorova

CHROMATOGRAPH FOR DETERMINATION OF ADMIXTURES IN GASES. *(Assignee not given.) U. S. Pat. 3,578,757. 7p., May 18, 1971. 3 refs. (Appl. July 12, 1968, 6 claims).*

A chromatograph for the determination of mixtures of gases is described, which is capable of operating in the continuous process stream without changing over gas streams or electrical circuits while in operation. Disadvantages of previous chromatographs consist in their complicated construction and in the requirement for a preliminary cooling of the entire chromatographic column. The present chromatograph comprises a column bent in the form of a single helix coil or an arc of a circle and which is rigidly secured on the shaft of a drive device in a plane perpendicular to the axis of the shaft. The shaft is mounted in stationary supports so that one portion of the chromatographic column is immersed in a refrigerant bath, and at the same time the other portion of the column is in a heater. During the rotation of the shaft, the portions of the column subsequently pass through the cooling and heating zones. (Author abstract modified)

14403 APTIC NO. 32388

Sato, Yoshiko and Tsuguo Sawaya

FRACTIONAL DETERMINATION OF NITROGEN OXIDES (NO, NO2). *(Chisso sankabutsu (NO, NO2) no bunbetsu teiryo ho ni tsuite). Text in Japanese. Preprint, Japan Society of Safety Engineering, Tokyo, p. 82-83, May 1970. (Presented at the National Symposium on Safety Engineering, 1st, Tokyo, Japan, May, 1970, Paper 41.)*

Nitric oxide and nitrogen dioxide were fractionally determined by potassium permanganate and sodium hydroxide solutions that oxidized as well as absorbed No and NO2. A diagram was derived that show the relationship between the molar fraction of NO in the gas mixture of NO and NO2 and the NO2(-)/NO3(-) in the alkaline KMn04 solution. By determining the amount of NO2(-) and NO3(-) in the solution, the approximate molar fraction of NO can be obtained from the diagram. Another diagram could be derived that shows the linear relationship between the absorption rate of the solution and the molar fraction of NO in the sample gas. Using the above method, fractional determinations of NO and NO2 are possible even when acidic gases such as ozone or organic peroxides are present in the sample gas.

14404 APTIC NO. 31886

Scaringelli, Frank P., Ethan Rosenberg, and Kenneth A. Rehme

COMPARISON OF PERMEATION DEVICES AND NITRITE ION AS STANDARDS FOR THE COLORIMETRIC DETERMINATION OF NITROGEN DIOXIDE. *Environ. Sci. Technol., 4(11):924-929, Nov. 1970. (Presented at the American Chemical Society, Division of Water, Air, and Waste Chemistry, 157th Meeting, Minneapolis, Minn., April, 1969 and at the University of California, Conference of Methods in Air Pollution and Industrial Hygiene Studies, Berkeley, Calif., March 30, 1970.)*

The most commonly used procedure for determination of the oxides of nitrogen in air is the colorimetric method of Saltzman. The ratio of the quality of dye produced from nitrogen dioxide to that produced from nitrite ion has been the subject of considerable controversy. Permeation tubes were used to prepare standard atmospheres at realistic levels, 0.02 to 1.8 ppm of NO2. Precautions are enumerated for the use of permeation devices in preparing standard concentrations of NO2 in air. After hundreds of analyses, it was established that one mole of NO2 is equivalent to 0.764 plus or minus 0.005 mole of nitrite ion with use of the unmodified Saltzman reagent. (Author abstract)

14405 APTIC NO. 31851

Schnelle, Karl B., Jr. and R. Douglas Neeley

TRANSIENT AND FREQUENCY RESPONSE OF AIR QUALITY MONITORS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa. 24p., 1971. 9 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-5.)*

Results of dynamic or transient tests and steady state calibration of carbon monoxide and sulfur dioxide continuous air quality monitors are reported. Standard gases and permeation tubes were used to establish low level concentrations both for the steady state calibration and the dynamic testing. The steady state calibration was in excellent agreement with results obtained from grab samples of the calibration gas stream taken with standard gas bubblers and analyzed by the West and Gaeke procedure. A model to describe the transient and frequency response is given and its parameters reported for the Beckman 906 and 906A sulfur dioxide instruments and the Intertech and Mine Safety Appliances carbon monoxide analyzers. The tests were sensitive enough to show the improved response of the Beckman 906A instrument over the 906 and indicate the influence of flow rate on the concentration time curve. There are indications that the sulfur dioxide monitors are dynamically too slow in response to indicate violations of regulations specifying maximum limits for short time periods. (Author abstract modified)

14406 APTIC NO. 31981

Sjogren, Arne

DETERMINATION OF CARBON CONCENTRATIONS IN FLUE GASES--PART 1: FROM THE COMBUSTION OF DISTILLATE OILS. *J. Inst. Fuel, vol. 44: 370-373, July 1971. 4 refs.*

A method and apparatus are described for fast and reliable determination of the carbon concentration in flue gases from the combustion of distillate fuel oil. This method is based on the principle of staining filter paper with soot, but differs from the current method for smoke number determination in that a variable volume of flue gas is drawn through the filter paper to give a fixed degree of staining (reflection). Thus, the volume of the flue gas is a measure of the soot concentration. The soot concentration is easily calculated from the known volume of gas by measuring the soot deposited on the filter paper at the chosen fixed staining. The heart of the apparatus is a measuring cell in which flue gas is drawn through the filter paper and a photocell measures the reflection calibration is also discussed. The method is currently used in an oil burner laboratory to determine the relationship between soot formation and excess air for oil firing.

14407 APTIC NO. 32177

Stanley, N.

THE PENETRATION OF FILTER PAPER BY COAL-DUST PARTICLES IN THE RESPIRABLE SIZE RANGE. *Ann. Occupational Hyg., vol. 4:295-299, 1962. 7 refs.*

The reduction in the amount of light transmitted through filter paper due to absorption by deposited dust particles provides a simple method of measuring the concentration of an airborne dust cloud. The extent to which the pentration of the filter paper by respirable dust size will affect the validity of such measurements was studied by measuring penetration through two different types of filter paper. At the low air flow rates used, coal dust particles greater than five micron did not penetrate either type of filter paper. Below this size there was some penetration, but its amount was too small to lower significantly dust concentrations estimated by densitometric means. (Author abstract modified)

14408 APTIC NO. 32294

Stephens, Edgar R.

INSTRUMENTATION REQUIREMENTS FOR LABORATORY RESEARCH. *Instrument Society of America, Pittsburgh, Pa., Proc. Symp. Air Pollution Instrumentation, Los Angeles, Calif., 1965, p. 8-10. (Oct. 5.)*

Air pollution research, products need to be measured as well as reactants, as in the case of photochemical smog where harmless materials are converted into harmful or noxious products. The reactants of research interest are the same substances important in source testing. Nitric oxide and hydrocarbons are the most important reactants; others, perhaps of secondary interest, are the oxygenates and sulfur dioxide. One of the most striking advances in the past ten years has been the application of gas-liquid chromatography to air pollution research, but some compounds of great interest still need improved methods. Electron spin resonance and microwave absorption are suggested for measuring nitrogen oxides. Advantages of physical methods over chemical ones are cited.

14409 APTIC NO. 31959

Stetter, G. and W. Stampfer

CHANGES OF THE CO2 MEASUREMENT VALUES IN THE AIR THROUGH ELECTRICAL FIELDS. *(Veraenderung der C02-Messwerte in Luft durch elektrische Felder). Text in German. Acta Phys. Austr., 33(1):80-82, 1971. 6 refs.*

Measurement differences of 5-20% were observed during the chemical determination of carbon dioxide in the atmosphere. The methods used were based on absorption in lye and titration. Higher values were obtained by placing the samples in a dark environment, thus indicating the influence of light. To compare the chemical methods with physical methods, infrared radiation and gas chromatographic techniques were utilized. Good correlation was found. An artificial electric field was created to simulate the influence of atmospherical electrical conditions. Control values were found to be lower than those values from samples exposed to the electric field.

14410 APTIC NO. 32276

Stockham, John and Howard Betz

STUDY OF VISIBLE EXHAUST SMOKE FROM AIRCRAFT JET ENGINES. *Preprint, Society of Automotive Engineers, Inc., New York, 17p., 1971. 13 refs. (Presented at the National Air Transportation, Meeting, Atlanta, Ga., May 10-13, 1971, Paper 710428.)*

A study was undertaken to relate the visibility of in-flight jet exhaust to the AIA smoke number. Engine smoke is currently determined by a filter stain technique described by the Aerospace Recommended Practice, and results are expressed as a numerical value known as the AIA smoke number. A method based on photographic photometry was developed for measuring the optical density of smoke plumes. This method was related to visibility and to the smoke number through transmissometer measurements and visibility theory. A portable transmissometer, capable of operating over a wide range of optical path lengths and under varying ambient light conditions, was fabricated for use on this study. The mathematical expression relating the transmission measurements to the smoke number was derived. Limited visibility requirements of smoke trails, developed from light scattering theory, correlated with actual visual observations and the transmissometer and photometry measurements. Tests results, with the engines investigated, indicate that AIA smoke numbers below 23 were associated with invisible exhaust plumes. Samples of the exhaust smoke showed the particles to be composed of lacy agglomerates. At the nozzle, the geometric median particle diameter was 0.052 micron. At a distance of 10 nozzle diameters the geomatric median particle diameter was 0.13 micron at cruise condition. (Author abstract modified)

14411 APTIC NO. 32467

Takagi, Sadayoshi, Tatsuo Kato, Tsugio Sawatani, Akio Tsuji, Hidetsuru Matsushita, and Takeo Miura

STUDY ON MAL-ODORS IN AIR POLLUTION. (INTERIM REPORT). *(Akushu kogai ni kansuru kenkyu. (Chukan hokoku)). Text in Japanese. Study Group on Bad Odors (Japan), 42p., March 1970.*

Problems pertaining to foul odors are difficult to solve or to quantitatively measure, since in perceiving them psychological aspects are involved. Characteristics, types, concentrations, and effects of odors on the physiological function of experimental animals are considered. An analytical method which utilizes gas chromatography and low-temperature condensation is described for measuring odors. Dry ice or liquid oxygen is used to adsorb the malodorous substances on diatomaceous refractory brick particles or glass beads at low-temperature. Substances used for comparison are generally mercaptans, sulfides, amines, aldehydes, or chlorides. Experiments were conducted at oil refineries, fish processing plants, and pulp mills. Another method involves solid reaction in a tube, and has a number of advantages such as moderate costs and easy preparation.

14412 APTIC NO. 32449

Taniguchi, Sadaichi, Koji Suzusho, and Satoru Imai

SIMULTANEOUS SPECTROGRAPHIC DETERMINATION OF NICKEL, MANGANESE, AND CHROMIUM BY PLASMA JET ARC TECHNIQUE. *Text in Japanese. Shimazu Hyoron (Shimazu Rev.), 28(2):99-102, June 1971. 8 refs.*

Emission sp[illegible]metry is now widely used in the field of environmental pollution, especially for the analyses of organic metal compounds contained in air and water. Since these samples are analyzed in solution or as acid or organic solvent extract, conventional emission spectrometry cannot ensure enough sensitivity. Therefore, the plasma jet arc has been employed as a new excitation source for emission spectrometry. Nickel, manganese, and chromium were simultaneously determined by the plasma jet arc technique, using a single working curve for each of these elements in various alloys. Apparatus and operating conditions are given for the evaluation of simultaneous determination. Also, the relation between arc temperature and the influence of extraneous elements for spectral intensity is discussed. (Author abstract modified)

14413 APTIC NO. 32138

Thomas, Fred W. and S. B. Carpenter

USE OF THE TITRILOG IN AIR POLLUTION STUDIES. *Instr. Soc. Am. Proc., vol. 2:1-7, 1956. 10 refs. (Paper 56-32-2.)*

The use of the Titrilog in a helicopter and in a car for monitoring sulfur dioxide in the vicinity of a Tennessee Valley Authority steam electric plant was described. Its advantages and disadvantages are discussed and records are compared with those from autometers. Advantages include portability, stability, and satisfactory temperature compensation which permits intermittent use in the open atmosphere without extended stabilization periods. Disadvantages are registration of the titration level rather than the concentration level, the necessity for planimetric measurement to arrive at average concentration, and the need for frequent calibration. However, this instrument is being used to an increasing extent, and a recent partial listing of current employment in air pollution studies includes 22 municipal, state, federal, consulting, and industrial groups. (Author summary modified)

14414 APTIC NO. 32229

Thomas, Fred W. and Charles M. Davidson

MONITORING SULFUR DIOXIDE WITH LEAD PEROXIDE CYLINDERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 4p., 1960. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 53rd, Cincinnati, Ohio, May 22-26, 1960, Paper 60-56.)*

Field experience in the use of lead peroxide cylinders for evaluating sulfur dioxide reactivity in the vicinity of large coal-burning steam plants was described. The cylinders provide a useful and economical means of estimating integrated sulfur dioxide exposure. In an area of moderate or average concentration, a high degree of correlation was noted between SO2 exposure and lead peroxide sulfation. No deterioration in the rate of reactivity of lead peroxide with SO2 was noted in periods as long as four months. This technique might be even more useful in certain industrial areas or in remote areas where power operated instruments cannot be used. Data from lead peroxide cylinders are useful in providing an estimate of corrosion potential as well as a measure of air pollution control. The higher average SO2 concentrations in urban or industrial areas should enhance effectiveness and largely eliminate analytical problems associated with low sulfation rates. The cylinders are used by the Tennessee Valley Authority measurement network.

14415 APTIC NO. 32303

Thompson, Richard J. and George B. Morgan

DETERMINATION OF ASBESTOS IN AMBIENT AIR. *Preprint, Environmental Protection Agency, Cincinnati, Ohio, 11p., 1971. 11 refs. (Presented at the International Symposium on Identification and Measurement of Environmental Pollutants, Ottawa, Ontario, June 14-17, 1971.)*

A method for measuring ambient concentrations of airborne asbestos, including the extremely small fibrils was described. Asbestos in a collected sample is reduced mechanically to fibrils (about 300 A in diameter), and the fibrils are measured by transmitting electron microscopy. The data engendered are in terms of the weight of asbestos per volume of sampled air. The fibrils are considered to be an ultimate chrysotile asbestos particle, which are reduced to fibers in the human body. Variations in the method lies in the way in which the asbestos fibers are reduced to fibrils and in the method of quantification. In one method, a watch glass is used to grind a sample suspended in amyl acetate on a microscope slide. Quantification is achieved by adding a known colloidal standard of gold-198 prior to ashing, and estimating the efficiency of recovery by radioactivity measurements -- fibrils are assumed to behave as does the gold standard. Another method involves the reduction of the fibers to fibrils by ultrasonication, followed by identificatin and quantification with the transmitting electron microscope. Preliminary data obtained by the method indicate that asbestos levels are about two micrograms/cu m at a point source, 0.5 to 15 ng/cu m at urban sites, and 0.1 ng/cu m at a nonurban site.

14416 APTIC NO. 31989

Tomita, Hiroshi

ON CONTINUOUS DETECTOR FOR CHLORINE GAS LEAKAGE. *(Renzokushiki enso gasu roei kenchiki ni tsuite). Text in Japanese. Nenryo Oyobi Nensyo (Fuel and Combustion), 38(8):33-42, Aug. 1971.*

In plants which manufacture or use chlorine, it is necessary to watch for leakage, as chlorine can be harmful. Chlorine compounds are also contained in the emissions from burning solid wastes. Acute poisoning from chlorine gas is manifested by its action on the eyes, nose, trachea, and lungs. Inflammation of the skin also occurs at high concentrations. The allowable limit is one ppm. Chlorine detection methods include detection tubes, tape techniques, electroconductivity analyzers, radiation measuring systems, and others. The Hokushin Co. has developed the Chlorl Detector which utilizes an electric cell, as well as another detector (Billion Air) which measures very small amounts of chlorine. If the reagent is changed, the latter method can also be used for detecting other gases, both acidic and alkaline. Pre-treatment is necessary to detect chlorine gas. If the sample is very hot, it must be cooled, and filter material and mesh conditions must be selected with care.

14417 APTIC NO. 32270

Villalobos, Richard and Robert L. Chapman

A GAS CHROMATOGRAPHIC METHOD FOR AUTOMATIC MONITORING OF POLLUTANTS IN AMBIENT AIR. *Preprint, Instrument Society of America, New York, N. Y. and Association for International Development, Paterson, N. J., 10p., 1971. 22 refs. (Presented at the ISA/AID Symposium, 17th, Houston, Tex., April 19-21, 1971.)*

An improved analytical method for the measurement of methane, ethylene, acetylene, carbon monoxide, carbon dioxide, and total hydrocarbons was devised. Full scale sensitivity was 1 ppm or better for the individual components and 200 ppb for the total hydrocarbons. A nickel catalyst methanator was used to convert CO to methane for detection by the flame ionization detector. Pure hydrogen carrier gas simultaneously satisfied the hydrogen requirements of the methanator and the fuel requirements of the flame ionization detector. Total hydrocarbon measurement was accomplished by a modification of the conventional continuous hydrocarbon analyzer technique. The use of air carrier completed the requirements for optimum flame ionization detector operation, thereby eliminating the need for a separate supply of inert carrier gas. An internal catalytic oxidizer removed traces of hydrocarbons in the air carrier to provide a true zero-hydrocarbon reference level. Use of a large discrete sample for the total hydrocarbon measurement provided a short term steady-state measurement and overcame speed of response limitations of the recorder. (Author summary modified)

14418 APTIC NO. 32192

Ward, J. H. and B. J. Thompson

IN-LINE HOLOGPAM SYSTEM FOR BUBBLE-CHAMBER RECORDING. *J. Opt. Soc. Am., vol. 57:275-276, Feb. 1967. 4 refs.*

The feasibility of adapting hologram techniques to bubble-chamber photography was studied in an experiment in which simulated particle tracks were photographed using an in-line Fraunhofer hologram method. Collimated light from a helium-neon laser was passed through a sample volume. A mirror inclined at a small angle at the rear of the simulated chamber reflected the beam back through the collimator objective lens. The light was then reflected by a small mirror and recollimated by another lens. The hologram was recorded from the reduced image of the sample volume. This method produced two holograms of every object in the sample volume, the depth of which was comparable to bubble chamber dimensions.

14419 APTIC NO. 31906

Ward, John M.

CARBON MONOXIDE DETECTOR. *(Armstrong Cork Co., Lancaster, Pa.) U. S. Pat. 3,577,222. 3p., May 4, 1971. 2 refs. (Appl. Nov. 15, 1968, 3 claims).*

A carbon monoxide detector is described which comprises two parallel mounted cylinders of an aluminum alloy having a high coefficient of linear expansion and spaced apart from one another on a commmon base. Hopcalite, a chemical catalyst of the type capable of generating heat when exposed to a minimal concentration of carbon monoxide, is mounted within a porous tube positioned within one of the aluminum cylinders. Perforations in the base of this cylinder will allow free air to enter the catalyst-containing aluminum cylinder and circulate about the catalyst. Due to the catalytic reaction of the carbon monoxide with the catalyst, a certain amount of heat will be generated.

This heat will cause linear expansion of the cylinder containing the catalyst. There will be no corresponding linear expansion of the adjacent parallel cylinder. However, due to changes in the ambient temperature of the air surrounding both cylinders, they both will expand an equal amount in reaction to the temperature changes of the ambient air. A microswitching mechanism mounted at the top of the two cylinders will be operated only when one cylinder is caused to expand to a greater extent than the other cylinder. Previous gas detecting devices have been incapable of compensating for a wide range of variation in ambient temperature.

14420 APTIC NO. 32257

Warner, P. O., L. Saad, and J. O. Jackson

IDENTIFICATION AND QUANTITATIVE ANALYSIS OF PARTICULATE AIR CONTAMINANTS BY X-RAY DIFFRACTION SPECTROMETRY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1971. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971.)*

Because of the synergistic effects which occur from the mixing of gases and particulates in ambient air, it is important that the determination of air pollutants be conducted on the sample in its native state without imposing any further chemical recombination during the analysis. X-ray diffraction spectrometry allows such a non-destructive method of analysis. It is suited for the identification of proprietary, but crystalline, mineral particulates, such as cement powder, slag dust, sinter emissions, and graphite coke. Powdered glass is used as a solid diluent. The most significant application of this method is the rapid quantitative determination of coke particulate in the presence of coal, where these materials are stored under conditions which may lead to their coentrainment. This method allows the rapid, relatively interference-free determination of materials, such as industrial binders, molding sands, mill scale, and carbonaceous particulates which possess some degree of crystallinity. The method was extended to the study of such gases as sulfur dioxide, which may be selectively fixed to an active surface. Data have also been gathered to show the effects of various gas-solid interfacial reactions on the diffraction patterns of particulates.

14421 APTIC NO. 31870

West, Philip W.

CHEMICAL ANALYSIS OF INORGANIC PARTICULATE POLLUTANTS. *In: Air Pollution. Arthur C. Stern (ed.), Vol. 2, 2nd ed., New York, Academic Press, 1968, Chapt. 19, p. 147-185. 88 refs.*

The amount of dust that settles from the atmosphere or that is washed from the air by rainfall is a fundamental measurement in the study of air pollution. For some studies it is advantageous to differentiate between water-soluble and water-insoluble materials. However, classical methods of qualitative analysis are now seldom employed, and quantitative studies by gravimetry and titrimetry are being replaced by special methods of analysis that offer advantages of sensitivity and selectivity. Of the classical methods, only colorimetry is widely used in the determination of inorganic pollutants, and even it is giving way to more sophisticated spectrophotometric or fluorimetric procedures. Basically, the analytical studies of air pollution involve trace analyses, but microchemical techniques are also widely used. Airborne particulates or aerosols consist of either liquid or solid particles ranging in diameter from 0.01 micron or less, up to about 100 micron. They may be isolated by sedimentation, filtration, impingement, centrifugation, or by electrostatic or thermal precipitation. There has been increased interest in measurements of the light transmitted or reflected by particulate deposits on paper or membrane filters, and procedures for evaluating dust or smoke stains are described. The gravimetric determination of suspended particulates is noted, as well as the preparation of filters and samples. Colorimetric and spectrophotometric analyses, ring oven methods, emission spectrometry, flame photometry, atomic absorption spectroscopy, and polarography are discussed.

14422 APTIC NO. 32006

Whitby, Kenneth T. and Benjamin Y. H. Lieu

ATMOSPHERIC AEROSOL SIZE DISTRIBUTIONS: SUMMARY OF RESEARCH. *Preprint, Minnesota Univ., Minneapolis, Particle Technology Lab., 12p., 1970 (?). 28 refs.*

Design improvements were made in the Minnesota Aerosol Analyzing System (MASS), which now comprises an optical counter, a nuclei counter, a mobility analyzer, and a multichannel analyzer. All parts of the system are connected to a data logging system so operation is simple and all data is recorded on punched tapes for convenient data processing. An internal clock makes it possible to operate the system from once every three min to once every 24 hrs. Urban aerosol size distributions measured with the prototype MASS showed a diurnal variation with concentration peaks corresponding to morning and afternoon traffic peaks. An automated MASS was used to obtain particle counts in 13 size ranges at 45, 70, 170, and 500 foot elevations in television tower studies. Minimum, mean, and maximum sizes under inversion and noninversion conditions are tabulated. Also summarized are significant results of laboratory studies and of theoretical studies. Comparisons are made between the data and the so-called self-preserving size distributions.

14423 APTIC NO. 32258

Whitby, K. T. and B. Y. H. Liu

INTRODUCTION. *In: Aerosol Measurements in Los Angeles Smog, Vol. I, Section I. Minnesota Univ., Minneapolis, Particle Technology Lab., Particle Lab. Pub. 141, Air Pollution Control Office APTD-0630, 16p., Feb. 1971.*

NTIS: PB 198816

A collaborative research study on the physical and chemical properties of Los Angeles smog aerosol was initiated to provide space, time, and technique coordinated data which could give new insights into the mechanisms of formation and the behavior of smog. The experiment, schedule, sampling site, and system are presented. The experiment may be divided into five main categories: measurement of the number versus size range from 0.003 to 6 micron, using the automated Minnesota Aerosol Analyzing System, which consists of an aerosol distribution and dilution system, an optical particle counter, a condensation nuclei counter, the Whitby Aerosol Analyzer, and a data acquisition system; sampling of the aerosol by Lundgren impactor for mass and chemical composition versus size distribution; continuous gas analyzers; turbidimetric measurements; miscellaneous experiments including cloud condensation nuclei and ice nuclei, samples for the electron microscope and single particle chemical analysis, humidity effects, smog making in a bag, smog coagulation in a bag, and particle beam experiments. The experiments, techniques used, and investigators involved are given.

14424 APTIC NO. 31994

Wiltshire, R. S. and W. H. Closhessy

APPLICATION OF SPACE TECHNOLOGY TO ATMOSPHERIC POLLUTION MEASUREMENT. *American Astronautical Society, Tarzana, Calif., Proc. Am. Astronaut. Soc. Symp., Las Cruces, N. Mex., 1969, p. 49-57. (Oct. 23-25.)*

The magnitude and nature of air pollution, kinds of pollutants, and effects of pollution on the earth's atmosphere are examined. Spacecraft-mounted instruments are reviewed as possible pollution detection sensors to give spectral information for identifying the atmospheric constituents by the transmission, scattering, absorption, reflection, and emission characteristics of the electromagnetic energy received. The ultraviolet spectrometer is capable of determining the species and quantity of constituents in the upper atmosphere. The laser, probing the atmosphere, can give a profile of the optical backscattering cross section of the atmospheric components. The infrared spectrometer gives a profile of the lower atmosphere and spatial distribution. The detection capabilities of the instruments include oxides of nitrogen, carbon, and sulfur; water vapor; ammonia, methane, various hydrocarbons; and organic vapors. The passive microwave radiometer detects ozone, oxygen, and water vapor in the atmosphere. It can reconstruct the atmospheric temperature profile by measuring the emission of atmospheric oxygen in the frequency range of 40 to 70 GH

14425 APTIC NO. 31807

Yasui, Shigeo, Haruo Mori, Kiyoharu Kishine, Seiji Takahashi, and Takeshi Murata

QUANTITATIVE GAS CHROMATOGRAPHY OF SULFUR IN HEAVY OILS. *Text in Japanese. Shimazu Hyoron (Shimazu Rev.), 28(2):97-102, June 1971. 3 refs.*

Gas chromatography was applied to the analysis of sulfur in heavy oils. The chromatograph used was equipped with a pyrolysis attachment. The column was PEG-6000 coated on terephthalic acid (solid support). Heavy oil samples diluted with carbon tetrachloride were burned in the combustion tube of the pyrolysis unit and the generated sulfur dioxide was quantitatively chromatographed. Sulfur recovery was 101.5 plus or minus 1.5%, the standard deviation 0.036, and the coefficient of variation 1.8%. The gas chromatographic results were in good agreement with those of the bomb method specified in the Japanese Industrial Standard. The chromatographic method has the advantage of requiring only 15 min for an analysis.

14426 APTIC NO. 32429

Zeedijk, H.

DETERMINATION OF THE SO2 CONTENT OF THE ATMOSPHERE. *(Het bepalen van het SO2-gehalte in lucht). Text in Dutch. Chem. Tech. (Amsterdam), 23(23):721-723, 1968. 7 refs.*

The development of a pollution warning system depends on accurate, instantaneous readings of pollution values, principally the SO2 content of the atmosphere. The possibilities for automatic measurement of SO2 content are considerably improved by the development of the bromometric method, which consists of making coulometric measurements by titration with bromine gas liberated by electrolysis. The air is conducted through a liquid containing 4 moles of H_2SO_4, 0.1 mole of KBr, and 0.000001 mole of bromine per liter. Readings are made with a platinum electrode and a reference electrode. Examples are given of graphic data collected with this instrument, which was tested from November 1967 to May 1968. It is sensitive to about 0.004 ppm SO2, is extremely accurate, and can be operated for more than three months without maintenance.

AIR QUALITY MEASUREMENTS

14427 APTIC NO. 31761

Public Health Service, Washington, D. C., Div. of Air Pollution and Robert A. Taft Sanitary Engineering Service, Cincinnati, Ohio

AIR POLLUTION MEASUREMENTS OF THE NATIONAL AIR SAMPLING NETWORK. ANALYSES OF SUSPENDED PARTICULATES 1957-1961. *Public Health Service, Washington, D. C., 217p., 1962. 12 refs. (Presented at the National Conference on Air Pollution, Washington, D. C., Dec. 10-12, 1962.) (PHS Pub. 978.)*

Every-year urban sampling stations were located in the largest city, in terms of population, in each of the 50 states, the District of Columbia, and Puerto Rico, to produce data on particulate air pollution for most of the major urban areas in the United States. Nonurban stations were located on farmlands, deserts, forests, mountains, and coastal areas. Suspended particulate matter consisting of smoke, dust, fumes, and droplets of viscous liquids and varying in size from below 1 micron to approximately 100 micron was analyzed. Besides suspended particulate matter, organic pollutants, soluble in benzene, inorganic pollutants, including nitrates, sulfates, and metals, and some radioactive materials were also classified. The national urban mean concentration of suspended particulates was 104 micrograms/cu m with a maximum concentration of 1706 micrograms/cu m. The mean level of suspended particulates for urban areas was nearly four times that for nonurban areas. The mean concentration of organics for urban areas was 7.6 micrograms/cu m with a maximum concentration of 123.9 micrograms/cu m for an individual sample. For specific urban stations, the mean concentrations ranged from 2.2 to 19.2 micrograms/cu m. In general, the mean concentration of organics for urban areas was about five times that for nonurban stations. All data on concentrations were compiled and charted. Detailed information on the sampling schedule, selection of station locations, data tables, analytic methods, and explanations of statistical terms are included.

14428 APTIC NO. 32047

Colorado State Dept. of Public Health, Denver, Air Pollution Control Section

REPORT ON AIR POLLUTION - COLORADO. *37p., 1968.*

Air pollution, with respect to sources, scope, and conditions which determine severity, is reviewed for Colorado. The determining topographical and meteorological factors are examined and air quality goals are set. Recommendations for future state legislation and future needs for pollution control are presented. The history of activities for 1956-1967, present programs for air pollution control and measurement, and special activities are examined. Data on suspended particulate matter and benzene soluble organic matter is presented for Colorado stations.

14429 APTIC NO. 32114

Joint Team for the Study of Photochemical Reactions (Japan)

REPORT OF THE STUDIES OF THE FORMATION OF HYDROCARBON AND SUBSTANCES OF PHOTOCHEMICAL REACTION AND ITS EFFECTS. *(Tankasuiso oyobi kokagakuhannobusshitsu no seisei narabini sono eikyo ni kansuru kenkyuhokoku). Text in Japanese. 53p., April 1971. 11 refs.*

Low-grade hydrocarbons and aromatic hydrocarbons in Tokyo air were measured, and a gaseous mixture of three aromatic hydrocarbons and nitrogen dioxide was analyzed for photochemical products. Also examined were the effect of ozone ventilation on the pressure-volume relation in excised dog lungs and the application of gas chromatography for analysis of several hundred ppb peroxyacetyl nitrate. Air samples were analyzed for low-grade hydrocarbons with column chromatography and a flame ionization detector. Preparation of calibration curves and introduction of sample gas are described in detail. Hydrocarbon concentrations on streets and crossroads were 118-491.5 ppb. Concentrations decreased with distance from the street. Excessive amounts of N-pentane, isopentane, and N-butane were present in street air as components of exhaust gas. Low-grade hydrocarbon concentrations were generally high during smog and showed less tendency to decrease with height during smog. No particular relationship was found between meteorological conditons and hydrocarbon concentration. Results of six types of measurements are reported for aromatic hydrocarbons at four sites in Tokyo. Among aromatic hydrocarbons, benzene was relatively stable in the presence of light irradiation. Toluene and m-xylene decreased with time during irradiation.

14430 APTIC NO. 31745

Adamova, A. A. and M. A. Krivetskaya

A STUDY OF THE MICROORGANISMS IN THE AIR OF LENINGRAD. *Sov. Zh. Vrachebnyi, vol. 17:899-904, 1939. 3 refs. Translated from Russian by Eldon E. Ewing. Army Biological Labs., Frederick, Md., Technical Information Div., 6p., July 1, 1968.*

CFSTI, DDC: AD 673017

The number and character of the microorganisms in the air of Leningrad in its different districts were determined. The three methods of investigation included Koch s precipitation method, D yakonov s method, in which one studies the quantity of microbes in a definite volume of air that is drawn through a cylinder containing a liquid absorbent and beads, and investigation of the microflora in freshly fallen snow. The number of microorganisms in the outside air, and the amount of solid and gaseous admixtures in it, can serve as an indicator if the degree of contamination at different points of the populated area. Because the chief source for contamination of the air is the soil, the number of microbes in the air in the same populated area depends on the amount of atmospheric precipitation, the degree of moisture in the soil, the amount of street traffic, and the velocity and direction of the wind. The greatest number of microorganisms/cu m of air in Leningrad was detected at points where there was the most traffic, such as factories and the train station. The air is contaminated by the soil microbes that are most resistant to drying and ultraviolet radiation. Micrococci and sarcinae, saprophytic sporogenic bacilli of mold, and yeast were detected.

14431 APTIC NO. 31760

Anderson, D. M., R. S. Brief, J. Churchill, J. R. Davis, P. A. Drinker, Jr., L. B. Hall, E. K. Harris, M. M. Harris, R. I. Larsen, E. H. Markee, F. Pooler, A. T. Rossano, N. E. Schell, J. J. Schueneman, P. Skaliy, J. Walters, C. A. Weishampel, and C. E. Zimmer

THE LOUISVILLE AIR POLLUTION STUDY. *Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio; Jefferson County Air Pollution Control Board; Louisville and Jefferson County Board of Health; Kentucky State Dept. of Health, TR-A61-4, 172p., 1961. 88 refs.*

The primary objectives of the air pollution study in Louisville, Ky. were to prepare an inventory of air pollutants emitted to the atmosphere with special regard to major sources, to determine the range of influence of pollutants arising in western Louisville, to evaluate the effect of pollutants on residents and the effect of pollution on materials, to obtain a detailed analysis of contaminants in the atmosphere, and to determine the bacterial content of the air over Louisville. An inventory of pollutant emission was made by source sampling and analysis and estimations based on existing emission information, combined with a knowledge of process throughputs, fuel consumption, and similar data. Meteorological studies on the wind, temperature, humidity, precipitation, and solar radiation were conducted. Air quality studies included collection of suspended particulate matter by a high volume sampler, dust fall measurements, gas sampling for the presence of acetylene, aldehydes, chloride, nitrogen dioxide, total oxidant, ozone, phenol, and sulfur dioxide. Bacteriological studies, odor threshold determination, and a metal deterioration study were conducted. Results of the studies and recommendations were presented.

14432 APTIC NO. 32131

Audere, A. K.

CARBON MONOXIDE AIR POLLUTION IN SHOPS TESTING MACHINE AND TRACTOR MOTORS. *U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. vol 5:43-45, 1960. (Also Gigiena i Sanit., 24(5):79-80, 1959.)*

Nine shops in machine and tractor stations were inspected and 20 air samples were obtained in the working areas at workers inhalation levels in the motor testing division. The air, in the motor testing shops built according to the standard plans and in those located in old reconditioned buildings, contained a relatively high concentration of carbon monoxide during the testing of different types of motors. General exhaust ventilation installed in motor testing departments was inadequate for the purpose of lowering concentrations of carbon monoxide to the limit of tolerance. Local forced exhaust ventilation alone, installed directly at the exhaust pipe of the tested motor, reduced the concentration of carbon monoxide to the limit of tolerance.

14433 APTIC NO. 32051

Boone, Ronald

AIR QUALITY OF WESTERN NORTH CAROLINA. *Buncombe County Health Dept., N. C., Public Health Service Div. of Air Pollution Proj. Grant 65-A-3603-RD, 98p., 1965 (?).*

Initial sampling began in four Western North Carolina counties, areas with long histories of air pollution or with suspected air pollution. Clean air stations were also set up in each of the four counties. Results obtained indicated that a higher than desirable concentration of air pollution existed at all stations at one time or another. In the winter months, the soiling index and particulate matter values were higher than in the warmer months. They were also higher in and around industrial areas. Lower and higher concentrations of air pollutants were found at all sampling locations, depending on the meteorological conditions. A survey of business and industry in the area was conductd by means of questionnaires requesting information on products manufactured, amounts of fuel used, type of equipment, and use of control equipment. The three main fuels used were coal, natural gas, and fuel oil. The information received was used in the total emissions. The recommendations indicate a need for the adoption of regulations to regulate and prohibit certain air contaminants emission into the air and the establishment of an air quality measurement program, which includes coninuous monitoring stations, continuous emission inventory, education of the public, enforcement of regulations, and coordinating administration.

14434 APTIC NO. 32292

Clifton, Marjorie

THE NATIONAL SURVEY OF AIR POLLUTION IN THE UNITED KINGDOM. *Council of Europe, Committee of Experts on Air Pollution, Air Pollution Proc. First European Congr. Influence Air Pollution Plants Animals, Wageningen, Netherlands, 1968, p. 303-313. (April 22-27.)*

The form of the United Kingdom National Survey of Air Pollution, inaugurated in 1960, was determined by the importance of pollutants which, although universally present, are insidious and therefore underestimated. Twenty-four hr measurements of fine suspended particles (smoke) and sulfur dioxide are made at nearly 1300 sites in England and Wales. The equipment used is simple and inexpensive. Smoke concentrations are estimated from the darkness of the stain formed by particles collected on cellulose filters; sulfur dioxide concentrations are calculated from the acidity of the dilute hydrogen peroxide solution in which air samples are absorbed. Every type of community is represented, and instruments are placed in residential, industrial, and commercial districts. Rural districts are also studied. The Survey is coordinated and supervised by the Warren Spring Laboratory of the Ministry of Technology. Two other instruments based on the same method of sampling have been developed by the Laboratory. One is a directional sampler with which wind speed and direction can be recorded on tape. The other, a portable instrument with time controls, takes 24-hr samples for a week without attention. Results of

Survey measurements are published first as monthly summaries and later as annual summaries with seasonal and yearly means. (Author abstract modified)

14435 APTIC NO. 32446

Furuno, Akiyoshi

SURVEY ON THE PRECIPITATING DUST DISCHARGED FROM A CEMENT PLANT. *(Semento kojo no koka funjin chosa Text in Japanese. Shiga Kenritsu Kikai Kinzoku Kogyo Shidosho Ho (Rept. Shiga Prefect. Inst. Machine Metal Ind.), 1968:63-76.*

Dust precipitated from a cement manufacturing plant located in the area of Hikone City was measured for 1967-1968. Deposit gauges were placed at 20 locations within the city, at distances of 1000 m, 1000-2000 m, and more than 2000 m from the plant. The dust, collected together with rainfall during each one-month period was analyzed with respect to stored volume of water, pH, soluble substances (calcium oxide and silicon dioxide), insoluble substances, and total volume. The quantity of precipitating dust decreased from 1967 to 1968 as a result of an electric dust collector installed in the plant. The pH value was lowest at locations furthest from the plant. The soluble matter decreased with increasing distance from the plant; the insoluble substances began to increase again at a distance of 1-1.5 km. The amount of precipitated dust increased with an increased volume of stored rainfall. The insoluble substances increased in the summer. The average monthly concentration of dust collected within 500 m from the plant was 7.79 t/sq km or three times the amount collected 2000 m or more from the plant. The same was true for CaO and SiO_2 concentrations. There were more insoluble than soluble substances at locations 1500 m or more from the plant.

14436 APTIC NO. 31875

Godbert, A. L. and E. Leach

A PRELIMINARY SURVEY OF THE POLLUTION OF MINE AIR BY NITROGEN OXIDES FROM DIESEL EXHAUST GASES. *Safety in Mines Research Establishment, Buxton (England), RR-265, 12p., 1970. 4 refs.*

NTIS: PB 196988

Mine air samples, representing the air breathed by men working in atmosphere polluted by diesel locomotive exhaust gases, were analyzed to determine the concentration of nitrogen dioxides present. Estimates were also made of the concentration of the two components of the total nitrogen oxides, nitric oxide, and nitrogen dioxide. The effect of the concentrations of toxic gases by variable factors such as the amount and relative speed of the ventilating air, the locomotive, and the type of locomotive was determined. In nearly all cases, the concentrations of nitrogen dioxide and nitric oxide were well below the recommended limits. Statistical analysis of the results showed that none of the variable factors considered had a significant influence on the concentration of nitrogen oxides breathed by the men. (Author abstract modified)

14437 APTIC NO. 32259

Hidy, G. M., S. K. Friedlander, and W. Green

BACKGROUND INFORMATION ON SITE AND METEOROLOGICAL EXPERIMENTS. PASADENA SMOG EXPERIMENT. *In: Aerosol Measurements in Los Angeles Smog, Vol. I, Section II. Minnesota Univ., Minneapolis, Particle Technology Lab., Particle Lab. Pub. 141, Air Pollution Control Office APTD-0630, PHS Grant AP-00680-02, 18p., Feb. 1971. 14 refs.*

NTIS: PB 198816

The general character of the observational site, an inventory of sources, and the meso-scale meteorology of the Los Angeles basin are presented. The physical site in Pasadena is described in detail and a brief summary of the meteorological instrumentation and support of the program is presented. Typical stationary sources producing a variety of pollutants include chemical processing equipment, boilers and heaters, paint bake ovens, incinerating equipment, melting equipment, and power plants. The power plants release mainly nitrogen oxides to the atmosphere. Typical contaminant concentration levels are listed for the summer months in West San Gabriel Valley. The broad scale features that characterize Los Angeles weather are the Pacific high pressure zone which dominates the synoptic scale atmospheric motion from early spring to early fall, the continental high pressure region over the deserts and high plains to the east and north which is present most of the period from fall through winter, and the winter passage of cyclonic storms originating to the north, south, and west over the Pacific. In addition to direct observations made from the roof of Keck Laboratories, several parameters were recorded from local sources. Some meteorological charts and data on emissions and meteorological instrumentation are included.

14438 APTIC NO. 32387

Kogo, Tettaro, Ryosaku Endo, and Tatsunori Oyake

AIR POLLUTION OF SAPPORO IN HEATING SEASON. PART III. RESULTS OF MEASUREMENTS AT NATIONAL AIR POLLUTION MONITORING NETWORK, SAPPORO STATION. *(Fuyu no Sapporo taiki osen. Dai-3-no. Kukusetsu taiki osen sokuteimo Sapporo sokuteisho no sokutei kekka ni tsuite). Text in Japanese. Hokkaido Ritsu Eisei Kenkyushoho, 20:146-156, June 1970. 9 refs.*

The National Air Pollution Monitoring Network Station in Sapporo, Japan was established in July 1968. Results are presented for measurement, from that date to March 1969. The subjects of measurement were sulfur dioxide, nitric oxide, nitrogen dioxide, and suspended particulates. For pollutants in general, the concentrations were low in summer, started to rise around October, and became very severe between November and February. The daily variation in concentration showed peaks in the a.m. and in the p.m., at approximately the same time. For SO_2, the general average was 2.2 pphm, and the monthly average concentration was the highest in February at 0.47 pphm. The daily average was highest in January at 11.3 pphm, as was the hourly average at 30.6 pphm. Among nitrogen oxides, NO_2 averaged 3.5 pphm and NO 4.9 pphm; highest monthly averages were 5.4 pphm and 8.8 pphm for NO_2 and NO, respectively. The highest daily average was in December; 10.3 pphm for NO_2 and 28.1 pphm for NO. These values are much higher than those for Osaka and Kawasaki. For suspended dusts, the general average was 0.1 mg/cu m; the monthly average was highest in December at 0.16 mg/cu m. The daily average was also highest in December at 0.66 mg/cu m.

14439 APTIC NO. 31942

Kornmann, H., M. Fournier, and A. Polac

RESULTS OF AIR POLLUTION MEASUREMENTS UNDERTAKEN IN THE CANTON OF SAINT MAUR IN 1970. *(Resultats des mesures de la pollution de l air effectuees dans le canton de Saint Maur, en 1970). Text in French. Pollut. Atmos. (Paris), 13(50):116-123, April-June 1971.*

As in 1969, sulfur dioxide and particulate levels were measured in the atmosphere of the cities of Bonneuil, Creteil, Joinville, and St-Maur. Nine stations performed the measurements once a week, the tenth, located at St. Maur daily. The median annual SO_2 level in 1969 was 77 microgram/cu m in 1970 it was 88 microgram/cu m; the median annual particulate level in 1969 was 58 microgram/cu m, in 1970 it dropped to 46 microgram/cu m. The rise in SO_2 pollution levels is attributed to a longer heating season due to an inordinately cold spring. The decrease of particulate pollution is attributed to higher than normal precipitation (17%). The pollution levels recorded at particular measuring posts are related to the responsible industrial sources and to pollution control measures put into operation recently.

14440 APTIC NO. 31860

Mahoney, James R., William O. Maddaus, and John C. Goodrich

ANALYSIS OF MULTIPLE STATION URBAN AIR SAMPLING DATA. *Preprint, National Air Pollution Control Administration, Raleigh, N. C., Div. of Meteorology, 32p., 1969. 3 refs. (Presented at the Symposium on Multiple Source Urban Diffusion Models, Chapel Hill, N. C., Oct. 27-30, 1969.)*

Multiple station air sampling data in urban areas was studied statistically. Measured data consisted of an urban scale constituent, a contribution due to sources in the vicinity of the sampling station, and a contribution due to measurement and analysis errors. The significance of correlation coefficients calculated from paired series and the influence of averaging several individual data series prior to calculating correlations was examined. The error contribution to the total variance in most field data series was significant. Correlations between single station data and data from one station and an external predictor (such as meteorological parameter), were small in most cases. The errors and local phenomena reflected in the data from a single station mask much of the urban scale variability which correlated with most urban scale model predictors. An urban scale average, drawn from sampling stations widely scattered throughout the Boston study area, was the best index of large scale air quality pat erns. Maximum expected correlations coefficients can be calculated from the field data, and this value can serve as a criterion for the evaluation of air quality model projections. Whenever possible, a double set of instrumentation should be operated at one station within a sampling network to provide an excellent measure of the expected error variance in the field observations. Sulfur dioxide, smoke shade, and particulate data from the Boston monitoring network was used to study the error variance. Hourly, monthly, diurnal, and seasonal measurements were taken with tape stain samplers. Meteorological data studied included stability, wind direction, and sea and lake breezes. Also, computer generated graphic analyses were used. (Author abstract modified)

14441 APTIC NO. 32096

Matsuoka, Cho, Toshio Kitamura, Isao Tahara, Hideko Ogata, and Sumiko Atsumi

PRELIMINARY SURVEY OF THE AIR POLLUTION IN TOKUSHIMA PREFECTURE. PART VIII. MEASUREMENT VALUE OF SULFUR DIOXIDE BY MEANS OF LEAD DIOXIDE. *(Tokushima-ken ni okeru taikiosen yobichosa. Dai 8 ho. Nisankanamariho ni yoru aryusangasunodo no sokutei kekka). Text in Japanese. Tokushima-ken Eisei Kenkyusho Nenpo (Ann. Rept. Tokushima Pref. Inst. Public Health), no. 10:3-7, 1971. 1 ref.*

Results are reported for sulfur dioxide measurements made at 42 monitoring points in coastal industrial districts in the eastern part of Tokushima Prefecture from November 1969 to October 1970. Average yearly sulfur trioxide concentrations exceeding 0.5 ppm (the standard for nonpolluted air) were found at points in Imagiri industrial districts, including Itano County and Tokushima City, in a part of Komatsujima, and in a part of Anan City. Three sites located between two viscose rayon factories in Imagiri had a yearly average above 1.0 ppm, reflecting the influence of hydrogen sulfide emissions from the factories.

14442 APTIC NO. 32110

Matsuoka, Cho, Toshio Kitamura, Isao Tahara, Heiichiro Kondo, Mitsugu Kondo, and Kimio Takeda

PRELIMINARY SURVEY OF THE AIR POLLUTION IN TOKUSHIMA PREFECTURE. PART IX. MEASUREMENT VALUE OF SULFUR DIOXIDE AND SUSPENDED DUST BY AIR POLLUTION AUTO-ANALYZER, AND OBSERVATION RESULTS BY ANEMOMETER AND ANEMOSCOPE. *(Tokushima-ken ni okeru taikiosen yobichosa. Dai 9 ho. Taikiosen jidosokuteisochi ni yoru aryusangasu oyobi fuyufunjin no sokuteikekka narabini jikifukofusokukei ni yoru kishokansokukekka ni tsuite). Text in Japanese. Tokushima-ken Eisei Kenkyusho Nenpo (Ann. Rept. Tokushima Pref. Inst. Public Health), no. 10:9-39, 1971. 1 ref.*

The results of air pollution measurements of the eastern part of Tokushima Prefecture, an industrial area, are reported for Oct. 1969 Sept. 1970. Automatic air pollution measuring systems were installed at Kitajima Junior High School, Itano County and Tomioka Higashi Senior High School, Anan City. Automatic anemoscopes and anemometers were placed at Imagiri Okemon, Tokushima City, the Nakamachi town office, Naka County, and the Anan Health Center, Anan City. The density of sulfur oxide measured at the high schools conformed to the environmental standards. The average concentration of sulfur oxide (for one hour per year) at Kitajima Junior High School was lower than that at Tomioka Higashi Senior High School, but for other emissions the results were reversed. Local pollution from low chimneys and sulfureted hydrogen and hydrogen chloride gases were considered as causes. The average concentration of sulfur oxide at Tomioka Higashi Senior High School was 0.035 ppm, which included the steam power plant emissions; instantaneous pollution was controlled by making the chimneys higher. Suspended atmospheric dusts were measured at both high schools: 30% of the measurements exeeded the average concentration standard (less than 100 micrograms/cu m per hour for 24 continuous hours), while 90% of the measurements (average concentration per hour) were less than 200 micrograms/cu m.

14443 APTIC NO. 32007

McKee, Herbert C. and Ralph E. Childers

ESTIMATION OF ADDITIVE EFFECTS FROM MULTIPLE SOURCES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 26p., 1971. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-36.)*

Using meteorological diffusion equations, a computer program was developed to calulate the distribution of pollutants in an area affected by multiple sources, such as in a typical industrial district. Using rapid printout on a teletype terminal, data processing costs can be as low as two to three dollars for a printout showing distribution of pollutants over a distance of several miles and illustrating additive effects from multiple sources in the area. By integrating this method of data processing into a monitoring network and an emission inventory, the usefulness of monitoring data could be greatly increased to provide a much more realistic evaluation of ambient air quality within the area. (Author abstract modified)

14444 APTIC NO. 32055

Murphy, R. P.

THE PROBLEM OF AIR POLLUTION. *Preprint, Dept. of Public Health, Sydney (Australia), Air Pollution Control Branch, 8p., 1969.*

Air pollution has now reached especially significant levels in industrial cities. Smog episodes and health studies of bronchitis, mortality, and respiratory diseases have increased the urgings for pollution legislation. Therefore, Australian state, federal, and local governments have passed control legislation. The New South Wales Clean Air Act of 1961 established an advisory committee, licenses, and fees. Certain meteorological conditions can increase air pollution to the degree that illness and death can occur. An organization of engineers, chemists, and laboratory assistants was set up to implement the Clean Air Act. Emission limits were set after chemical and dust emission tests were made in exhaust flues. The main sources of air pollution are boilers, kilns, and furnaces which produce smoke, fly ash, and sulfur dioxide. Chemical plants, metallurgical processing, grinding, and milling also produce some contaminants like metal fumes and dust. Motor vehicle exhaust and smoke from shipping contribute as well. Air pollution was automatically monitored daily in Sydney, Newcastle, Port Kembla, Lithgow and Wollongong (dust fall, smoke haze, and SO2). Continuous recorders were also used to monitor hydrogen sulfide, nitrogen oxides, total oxidants, suspended inert dust, iron, copper, and lead. In Sydney, SO2 concentrations were usually lower than that for British cities, but high values sometimes occurred. A peak value of 270 ppm was recorded in 1967 with a maximum daily average of 57 ppm. Since crude oil and natural gas are being increasingly used, air pollution by sulfur gases should be reduced in the future. Surveys of motor vehicle exhaust showed slight oxidant content (an indicator of photochemical pollution), and some carbon monoxide, aldehydes, hydrocarbons, nitrogen oxides, suspended dust, and lead in congested traffic areas near the center of the city. The CO concentration reached a peak of 80 ppm, and the average value was 50 ppm. Adjustment of the idling speed reduced CO. Natural gas is replacing older fuels, but few Australian plants are eager to improve their existing plants and reduce pollution.

14445 APTIC NO. 32347

Paluch, Jan

AIR POLLUTION IN HIGHLY INDUSTRIALIZED AREAS. *(Einige Probleme der Luftverunreinigung in hochindustrialisierten Gebieten). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 9-25. (Sept. 9-14.)*

In Poland two sets of regulations (promulgated in 1966) govern maximal permissible emission levels, one for areas with special clean air requirements for example, spas and protected national parks, the other for areas with normal requirements. In the former the mmedian daily levels are 0.075 mg/cu m for SO2, 0.050 mg/cu m for H2SO4,0.050 mg/cu m for N205,0.5 mg/cu m for CO,0.75 mg/cu m for hydrocarbons, and 40 t/sq km/year for particulates. In normal areas the respective median daily levels are 0.35 mg/cu m for SO2,0.1/cu m for H2SO4,0.20 mg/cu m for N205,0.015 mg/cu m for CS2 and 250 t/sq km/year for particulates. Highest pollution is in the Katowice district, the cities of Krakow and Lodz, and in the Wroclav district followed by medium pollution in the Bydgoszcz, Krakow, Lodz, Opole, and Poznan districts, and the cities of Poznan, Warsaw and Wroclaw. The principal emission sources in the various cities and districts and SO2 emission levels and particulate levels in the Upper Silesian industrial basin and the Katowice district are given for 1965/67.

14446 APTIC NO. 32401

Prietsch, Wolfgang and Edmund Huenigen

ON THE AIR POLLUTION CAUSED BY CAR FUMES IN THE GDR SITUATION AND CONCLUSIONS. *(Zur Luftverunreinigung durch Kfz-Abgase in der DDR (Situation und Schlussfolgerungen). Text in German. Wiss. Z. Humboldt Univ. Berlin Math. Naturw. Reihe, 19(5):539-543, 1970. 31 refs.*

Short-time carbon monoxide levels measured by a mobile measuring van in Leipzig and in Berlin exceeded the maximum permissible emission concentration by 98.5 and 45.5% respectively. Levels of nitrogen dioxide and of formaldehyde in Leipzig exceeded the norm by 18.9% while in Berlin, these levels were below the norm. An analysis of CO measurements disclosed the existence of conspicuous rush hour maxima in the morning and afternoon and a minimum at night. The Economic Commission for Europe (ECE) of the U. N. has proposed two maximal emission concentrations for two exhaust gas components (CO, hydrocarbons. These are not related to hygienic requirements, the norms are graduated depending on the weight of the vehicle and roughly correspond to the actual emission by currently produced vehicles. While the toxicological equivalent of the three pollutants in exhaust gases (CO: CmHn: NO2) is 1:1.9:0.1 the ECE recommendation limits hydrocarbons 20 times more severely than it does CO. Nitrogen oxides, aldehydes, and other pollutants are not included in the ECE recommendations at all. The proposed norms may meet the U. S. requirements but are not in keeping with European hygienic postulates. The GDR proposal would limit CO to the ECE recommended level but would delay the setting of other norms until more data are available.

14447 APTIC NO. 32466

Salvaggio, John and John Seabury

NEW ORLEANS ASTHMA. IV. SEMIQUANTITATIVE AIRBORNE SPORE SAMPLING, 1967 AND 1968. *J. Allergy Clin. Immunol., 48(2):82-95, Aug. 1971. 32 refs.*

A semiquantitative survey of atmospheric spore concentrations in the city of New Orleans with the use of automatic intermittent rotoslide samplers was performed during the years 1967 and 1968. In comparison with a previous rotoslide pollen survey, spores were invariable detected in excess of pollen grains by a factor of 10 to 100. Relatively large spores of the deuteromycetes (fungi imperfecti) were easily identified morphologically. Identification of small spores was uncertain because of considerable group overlap and interspecies variation. Spores in this category were detected in highest quantity. Spores resembling large basidiospores were included in a third general category. Many myxomycete spores were also likely included in this category because of similar morphology. In all morphological categories, semiquantitative atmospheric spore counts were comparatively low in January and February. Counts increased sharply in March and April and increased variably throughout the summer and late fall months. Noticeable decreases were recorded in late November at or near the usual onset of local killing frosts. Petri plate colony identification, although performed only sporadically, was not as helpful as anticipated. Analysis of one typical large asthma epidemic (December 1968) revealed high rotoslide catches in all major spore categories but no sharp increase in total cultural colony count or obvious change in colony composition. (Author abstract)

14448 APTIC NO. 31775

Ter Haar, Gary L. and Michael A. Bayard

COMPOSITION OF AIRBORNE LEAD PARTICLES. *Nature, 232(5312):553-554, Aug. 20, 1971. 5 refs.*

Airborne particulate lead compounds were physically identified by using an electron microprobe. Samples were taken near and at a distance from a busy highway, in a rural area, immediately after automobile exhaust was discharged into a black bag, and in the bag 18 hours later airborne particulates were collected on membrane filters. The chief reaction products of the sample taken from the road and from the automobile exhaust after 18 hours were lead carbonates, oxycarbonate, and oxides. Very little bromine remained. The results from the black bag in the absence of light make it impossible for photolysis to account for the loss of halogen. In the black bag, the primary reaction appears to be a simple acid-base reaction with carbonate or hydroxide ion displacing the bromide ion and, in some cases, the chloride ion from the lead halides initially exhausted. Thus, lead oxide, lead carbonate, basic lead carbonate, or a mixture of these would be a good choice for experimental studies of the health effects of lead in the atmosphere.

14449 APTIC NO. 32350

Winchester, J. W. and R. A. Duce

NEUTRON ACTIVATION ANALYSIS OF LEAD HALIDE POLLUTION AEROSOLS. *International Atomic Energy Commission, Vienna (Austria), Proc. Symp. Nucl. Activ. Tech. Life Sci., Amsterdam, Netherlands, p. 631-643. 20 refs. (May 8-12.)*

Iodine, bromine, and chlorine were determined by neutron activation analysis in atmospheric samples of both natural and polluted origin. A comparison of the two sources provided the basis of a technique for determining the composition and possible source of lead halide pollution aerosols. The activation analysis consisted of reactor neutron irradiation of aqueous samples and comparators for 20 min followed by radiochemical separation of iodine, bromine, and chlorine. Also, beta radioactivity from solid silver halide sources was automatically counted. The determination of lead by anodic stripping voltammetry (inverse polarography) consisted of the deposition of lead radicals from the solution onto a composite paraffin-impregnated graphite and mercury electrode at -1.00 volts versus the standard calomel electrode, and then stripping by continuously increasing the potential. Ethyl fluid, a mixture of organic lead, bromine, and chlorine compounds, burns to form inorganic lead halide particles. In Cambridge, Massachusetts, analyses of cascade impactor aerosols were compared with similarly collected samples from the unpolluted air of Hawaii. The bromine component ranged from 0.4 to 0.1 or less of the lead concentration, indicating that in most cases the source was automotive lead with a bromine deficiency or a mixture of lead from automotive and other sources. In Fairbanks, Alaska, during the winter, atmospheric conditions favored high local concentrations of air pollutants. Aerosols collected by Millipore filters showed that chlorine pollution averaged very nearly the value predicted from the observed lead and the known composition of ethyl fluid; the source was indicated as automobiles. Bromine, however, was less than predicted, and the bromine deficiency was about the same in Fairbanks and in Cambridge. These results imply that ethyl fluid combustion is the major source of atmospheric lead in Cambridge and Fairbanks, and the observed bromine and chlorine pollution come predominantly from the same source.

ATMOSPHERIC INTERACTION

14450 APTIC NO. 31865

Weather Squadron, 15th, Charleston AFB, S. C., Detachment 3

TERMINAL FORECAST REFERENCE FILE, CHARLESTON AFB, SOUTH CAROLINA. *47p., Jan. 1971. 1 ref.*

NTIS, DDC: AD 718120

Factors affecting the weather at Charleston Air Force Base, South Carolina were discussed. Location and topography weather controls, climactic aids, and local forecast studies were included. The major air pollution source is a paper mill located about three miles east of the base. Under stable atmospheric conditions, the smoke shows no tendency to diffuse and actually forms a streamer visible for many miles. From the surface to 500 ft, the average wind is from an 80 degrees to 100 degrees in direction. With a low inversion present, visibility generally is reduced to three quarters of a mile to one and one half miles. When the inversion breaks, visibility increases to four miles or greater, depending on the wind and convective currents. A second smoke source is the Stark Industrial area on the bank of the Ashley River, three miles southeast of the base. This smoke has the effect of lowering visibility to about five miles when the lower 2000 to 3000 feet of the atmosphere is very stable and a sea breeze is blowing. Measurements taken include cloud height, visibility, wind direction, temperature, and pressure. Major and minor synoptic patterns for the four seasons were discussed. A thunderstorm study for the Charleston Air Force Base was also presented.

14451 APTIC NO. 31984

Japan Meteorological Assoc. (Japan)

REPORT ON METEOROLOGICAL SURVEY AND ANALYSIS OF AIR POLLUTION IN AND AROUND OMACHI CITY. *(Omachi-shi taiki osen kisho chosa kaiseki hokoku). Text in Japanese. 45p., Dec. 1969*

The meteorological conditions in and around Omachi City were surveyed for seven days (Sept. 15-21, 1969) to enable forecasting of potential air pollution from factories to be constructed in the industrial zone south of the city. Vertical distribution of wind direction and atmospheric temperature, velocity, horizontal and vertical distributions of ground-surface wind, and general ground weather conditions (temperature, humidity, insulation, and stability) were determined. Weather maps for all Japan were used as references. The wind was generally either from the north or south. The average wind velocity was 1.9 mi/sec. Nineteen (16%) of the total hours were calm. Wind direction was checked continuously during selected 30-minute periods for deviation from normal course. Wind within and outside a factory were compared, and the characteristics of wind in the upper stratum of the atmosphere were examined. Tabulated survey results, maps, and charts are included.

14452 APTIC NO. 32371

Council of Ministers (USSR), Voeykov Main Administration and Inst. for Industrial Buildings and Construction (USSR) Central Scientific Research and Experimental Project

RECOMMENDATIONS FOR THE CALCULATION OF DISPERSION IN THE ATMOSPHERE OF NOXIOUS AGENTS (DUST AND SULPHUR DIOXIDE), CONTAINED IN THE EFFLUENTS FROM INDUSTRIAL UNDERTAKINGS. *Gidrometeorolog. Izdat., 1967. Translated from Russian. National Lending Library for Science and Technology (England), 49p.*

A procedure for calculating dispersion in the atmosphere of dust and sulfur dioxide discharged by industrial installations and boiler plants is presented. Meteorological coefficients, ground level emissions, maximum allowable concentrations, the gas-air mixture in the flue gases, and topographic characteristics are examined. Single sources and groups of emission sources are considered and recommendations are given for calculating the background pollution of the air basin of a residential area and determining the boundaries of the health protection zone. Proposals for basic measures for protecting the air basin from pollution with the operation of industrial installations and boiler plants are presented. (Author abstract modified)

14453 APTIC NO. 32488

Osaka Environmental Pollution Control Center (Japan)

STUDIES FOR ESTABLISHING AIR CONTROL METHOD BY INTRODUCTION OF COMPUTER. NO. 2. *(Taikiosen boshi no tameno keisanki seigyo no hoho no kakuritsu ni tsuiteno kenkyu. No. 2). Text in Japanese. 144p., March 1969. 30 refs.*

The model of a numerical equation for computing the level of air pollution in major industrial cities was examined. The temperature coefficient of the atmosphere by the mixed diffusion of air pollutants was used as the parameter to indicate the level of atmospheric stability. The perpendicular distribution of temperature could be obtained by two methods, allowing the computation of the temperature conduction coefficient. Simultaneously, the height of the inversion layer was determined by computation. The four parameters in the model were examined and applied to data of actual measurements from Osaka Tower. There was a strong relationship between the volume of perpendicular transfer and the temperature conduction coefficient. The ground level concentration of sulfur oxides decreased when the value at ground level of the temperature conduction coefficient was large, and increased when the value was small. The level of pollution was very high when the difference between the maximum and minimum temperatures within one day was small and the wind was low. The effect of purification by dissolution of pollutants and adsorption by the surface of the earth was negligible. The variation of the values of wind direction and speed were larger for a low wind than for a high wind. Predictions of the wind direction and speed could be made only by experience. The computer programs for the computations are included.

14454 APTIC NO. 32042

Alet, Irenee

MASS SPECTROMETRIC STUDY OF IONS IN THE ATMOSPHERE. *(Etude des ions atmospheriques par spectrometrie de masse). Text in French. Toulouse Univ. (France), Centre de Physique Atomique et Nucleaire, Thesis (Ph.D.), 1970, 84p. 32 refs.*

NTIS: NP-18409

An apparatus for the mass spectometric study of ions in the atmosphere created by high pressures is presented. Experiments were performed to examine the nature of positive ions created in the atmosphere at pressures of 10 to 200 torr. by the glow discharge or irradiation of Polonium 210. The clustering phenomena found in the mobility experiments were observed. From positively charged ions of 02, N2, N3, N4, NO2, and H30 observed at high E/P, different positive stable clusters of NO(H20)n, NO2 (H20)n, and H30 (H20)n were formed. The importance of different organic impurities (ethanol, acetone, and ammonia) in the clustering phenomenon is examined.

14455 APTIC NO. 32033

Altomare, P. M.

TRANSPORT OF VAPOR AND AEROSOLS THROUGH AN INHOMOGENEOUS ATMOSPHERE. *Preprint, American Meteorological Society, Boston, Mass. and American Inst. of Aeronautics and Astronautics, New York, p. 462-469, 1970. 3 refs. (Presented at the National Conference on Aerospace Meteorology, 4th, Las Vegas, Nev., May 4 - 7, 1970.)*

An analytical model is presented for the prediction of downwind contaminant concentration following an explosive puff release of material to the atmosphere, where the interacting atmosphere would be defined as variable with height in wind direction, wind speed, and dispersion characteristics. The atmosphere is defined by vertical layers, each layer of which can be different in wind speed, wind direction, and stability classification. An equation is calculated that is equally applicable to particulate or vapor material. In the case of a vapor, the fall velocity is zero and the traced point leaves the layer due to cloud expansion effects alone. Variations of these equations are used to obtain air and ground deposition concentration patterns. Two methods for ground deposition are presented and compared. The effect of wind shear is demonstrated and the effect of varying meteorological layers on a vapor cloud is considered. The atmospheric transport model is compared with an averaging approach.

14456 APTIC NO. 32158

Atkins, Patrick R. and Paul Kruger

THE NATURAL REMOVAL OF LEAD POLLUTANTS FROM A SUBURBAN ATMOSPHERE. *Stanford Univ., Calif., Dept. of Civil Engineering, Federal Water Pollution Control Administration Training Grant WP-009, Research Fellowship 5F1-WP-33,496, TR-98, 220p., Aug. 1968. 75 refs.*

The removal of lead from the atmosphere by natural cleansing processes after being injected into the atmosphere was studied. A field sampling program was conducted in Palo Alto, Calif. to determine the effectiveness of sedimentation, impaction, rainout, and washout in removing lead contaminants from the atmosphere. A laboratory study was also conducted simultaneously to determine how well specific lead compound aerosol particles act as nuclei for droplet formation. A modified thermal-gradient diffusion chamber was used to produce slightly supersaturated conditions similar to a growing cloud. The field sampling data indicate that sedimentation is responsible for a major portion of the lead removal which occurs in the Palo Alto area. More than 90% of the lead pollutants reaching the surface during the one year sampling period were collected in dry fallout. Approximately one percent of the total dry fallout collected near a major expressway was lead. A correlation was found between the lead particulate matter and total dust fall in the dry fallout samples. The limited rainfall accounted for five to 10% of the lead removal at the sampling sites. Lead concentrations in excess of one mg/l were found in some rainfall samples, and average concentrations of 0.18 and 0.04 mg/l were observed near the freeway and at the outskirts of the city, respectively. Sedimentation and rainfall scavenging are relatively inefficient processed for the removal of submicronic particles. A growth process must occur to make the lead particles susceptible to these cleansing processes. The field data suggest that the formation of water droplets around the lead particles may account for the rapid removal of lead pollutants. The nucleation studies show that lead compound particles may act as nuclei for droplet formation. The results indicate that the thermodynamic approach using accepted values of solubility, wettability, and heat and vapor diffusion, fails to adequately describe the nucleation process.

14457 APTIC NO. 32253

Beaufait, William R. and Owen P. Cramer

PRESCRIBED FIRE SMOKE DISPERSION-PRINCIPLES. *Forest Service, Missoula, Mont., Div. of Fire Control, In-Service Distribution No. 5100, 12p., Aug. 5, 1969.*

When prescribed fire is used to manage forested land, precautions must be taken to avoid undesirable side effects such as air pollution. Prescribed fires were examined under varying conditions of weather, fuel moisture, and fuel volume to evaluate these variables on burn effectiveness and smoke plume behavior. Plume behavior is determined by the intensity of the fire, the air temperature above the fire, and the existing wind and turbulence conditions. The hotter the plume, the higher the rise. Air stability can also influence plume rise: in stable air, a rising plume reaches the same temperature as the surrounding air at a low altitude so smoke is trapped close to the Earth s surface; in unstable air, the plume rises much higher before reaching the temperature of the surrounding air. The time of day, seasons, and terrain also influence smoke dispersion. The smoke usually rises in a convection column to form a main plume with some drift smoke at a lower level. To improve air quality, constraints can be made on individual prescribed fires, fires to windward of smoke sensitive areas, acreage to be burned simultaneously to windward of sensitive areas, the total acreage to be burned in wildlands, and the prohibition of all prescribed burning in wildlands. Weather forecasting, type of fuel, topographic location, and test fires can be used to schedule fires intelligently.

14458 APTIC NO. 31817

Bierman, George F., George A. Kunder, Joseph F. Sebald, and Robert F. Visbisky

CHARACTERISTICS, CLASSIFICATION AND INCIDENCE OF PLUMES FROM LARGE NATURAL DRAFT COOLING TOWERS. *Preprint, Illinois Inst. of Chicago, Technical Center, 24p., 1971. 6 refs. (Presented at the American Power Conference, Annual Meeting, 33rd, Chicago, Ill., April 22, 1971.)*

The wet type cooling tower, primarily the natural draft type, was examined with regard to plume rise and its relation to the effects of tower type and size, developments in drift reduction, plume classification, and correlation of ground level meteorology and plume behavior. Plume penetration of inversions and/or plume rise were in direct proportion to the diameter of the plume discharge section of evaporative cooling towers. This implied that single large towers for a given size installation would result in a reduced probability of ground fogging or icing. Conversley, large installations, comprised of multiple unit low elevation discharge cooling towers, had a tendency to contribute to ground fogging phenomena. Local meteorology, specific location, land use, general topography, and design and type of equipment require careful study to determine suitability of equipment type for any given site. The tentative standard for cooling tower drift quantity of 0.03% of cooling water flow as a major improvement in relation to reducing the possible effects of salt fallout. The projected 0.002% drift quantity should effectively minimize artificial salt fallout; high plume rise with incidental suspension of the small (1 micron or less) droplets of drift as particulate matter and associated increase in dispersion because of height further diluted salt fallout concentration. The developed classification plume technique was useful in describing plume type, incidence, and characteristics. The criteria established were plume duration to complete evaporation, plume duration to absorption in overcast, and special cases, mainly cloud building or other unusual behavior. The studies indicated a reasonable possibility of predicting, from published weather data, the nature and frequency of natural draft cooling tower plumes of this first category. Estimates about the second category can be made from weather reports on the incidence of inclement, low overcast weather associated with the area under consideration. (Author summary modified)

14459 APTIC NO. 31823

Bowne, Norman E., Herbert D. Entrekin, and Gerald E. Anderson

AN ANALYSIS OF THE EFFECT OF TERRAIN IRREGULARITIES OF TURBULENCE AND DIFFUSION IN THE SURFACE BOUNDARY LAYER. *Travelers Research Corp., Hartford, Conn., AEC Contract AT(30-1)-4140, CEM-4045-419, 148p., Oct. 1970. 12 refs.*

NTIS: NYO-4140-1

Wind and temperature fluctuation data were collected in conjunction with a diffusion program through wooded areas in north central Arkansas. These meteorological data are examined and compared with existing theories of boundary layer turbulence and turbulence data collected at other sites. Even though the surface is not homogeneous, and evidence of the effect of changing surface characteristics can be found in the data, general universal functions and relationships predict the intensity of longitudinal and lateral turbulence with skill. Vertical turbulence was not as great as predicted by similarity theory and associated constants. This is attributed to the damping effect of the surface and vertical thermal stability during the observational periods. Spectrum analysis of the wind components and temperature fluctuation revealed that eddy energy was spread over a wide range of frequencies, as expected, and that peaks in the spectra occurred at the highest frequency for vertical velocity, at a lower frequency for lateral and longitudinal components, and the temperature peak was nearly an order of magnitude lower than the wind components. Cross spectrum analysis showed that heat flux was generally upward at low frequencies and downward at high frequencies. Patterns were reasonably well behaved during periods of thermal stability and chaotic during unstable periods. Data from six towers 90 meters high were used to assess the representativeness of observations of wind direction, speed and vertical temperature differences for tower separation distances of six to 14 miles. (Author summary modified)

14460 APTIC NO. 31769

Bricard, J., M. Cabane, G. J. Madelaine, and D. Vigla

PRODUCTION OF AEROSOLS IN RELATION WITH THE PHOTOOXIDATION OF THE SULFUROUS ANHYDRIDE. *(Production d aerosols en relation avec la photo-oxydation de l anhydride sulfureux). Text in French. Aerosol Sci., 2(2):275-280, June 1971. 7 refs.*

New experiments pertaining to the formation of particles by means of photolysis are reported. By using controlled atmospheres and filtered atmospheric air; the role of nitrogen dioxide in the production of condensation nuclei is shown to be due to photooxidauion of sulfur dioxide. (Author abstract)

14461 APTIC NO. 31905

Bricard, J., M. Cabane, G. Madelaine, and D. Vigla

STUDY OF THY MOBILITY OF IONS IN AIR. *(Etude de la mobilite des ions de l air). Text in French. Aerosol Sci., 2(2):193-199, June 1971. 4 refs.*

A method is described for establishing the mobility spectrum at atmospheric pressure of small ions produced by alpha-particles. The effects of time of exposure to air and of the humidity of the air are investigated. (Author abstract)

14462 APTIC NO. 31972

Bricard, J., M. Cabane, G. Madelaine, and D. Vigla

FORMATION AND PROPERTIES OF ULTRAFINE NEUTRAL PARTICLES FROM ATMOSPHERIC GASEOUS IMPURITIES. *(Formation et proprietes des particules neutres ultrafines a partir des impuretes gazeuses de l air). Text in French. Pollut. Atmos. (Paris), 13(50:101-107, April-June 1971. 16 refs.*

The mechanism of aerosol formation from gaseous pollutants in the air and the properties of particles of photolytic origin were studied by irradiation of various gaseous mixes with a mercury lamp in a spherical reaction chamber and by measuring the number of condensation nuclei with a particle counter. No particles were produced by the irradiation of oxygen with nitrogen in the presence of six ppm sulfur dioxide, the irradiation of the same mixture with from one ppm water vapor to 40% relative humidity or the irradiation of a mixture of nitrogen with up to five ppm SO_2 and up to four ppm nitric oxide. Particles did form by irradiation of pure nitrogen containing two ppm SO_2 and 0.5 ppm nitrogen dioxide. Particle formation depends on NO_2 concentration. With 0.5 ppm NO_2, 6000 particles/cu cm formed, with two ppm NO_2, 150,000. The SO_2 concentration increase has a similar effect: an increase of SO_2 concentration from two to 12 ppm resulted in a particle count increase from 300 to 30,000/cu cm. Thus, aerosol formation is due to the interaction of SO_2 with a neucleogenic substance, which in this case is NO_2. Direct photooxidation of SO_2 in concentrations comparable to those which are present in ambient air does not lead to an appreciable formation of aerosol. The above confirms that the transformation of SO_2 to sulfuric acid can proceed via aerosol formation by photolysis.

14463 APTIC NO. 32226

Brocas, J. and R. Delwiche

CL, K, AND NA CONCENTRATIONS IN ANTARCTIC SNOW AND ICE. *J. Geophys. Res., 68(13):3999-4000, July 1, 1963. 7 refs.*

A hundred samples of precipitation, firn, and ice from Antarctica were collected in Queen Maud Land in the vicinity of Base Roi Baudoin. Possible seasonal variations of salt content were measured to relate the nearness of the open sea. Chlorine was measured by an indirect colorimetric method using chromate ions. Sodium was determined by flame photometry and potassium by isotopic dilution using a tracer enriched in the stable K-41 isotope. Mass spectrometry also revealed the presence of lithium, aluminum, silicon, cadmium, rubidium, and strontium. It was concluded that Cl concentrations decrease from the coast to the interior of the continent. Sodium concentrations follow the same pattern but increase in the mountainous area 300 km south of the coast. The K concentration did not show any important geographical variation.

14464 APTIC NO. 32499

Broto, H. and J. Lacaze

THE ROLE OF ATMOSPHERIC INVERSION IN THE PROPAGATION OF ATMOSPHERIC POLLUTION. *(Role des surfaces d inversion dans la propagation de la pollution atmospherique). Text in French. Pollut. Atmos. (Paris), 13(50:108-110, April-June 1971. 2 refs.*

Damage due to atmospheric pollution is greatest when air movement is minimal and when the source of pollution is covered by an atmospheric inversion. While meteorological effects giving rise to inversion surfaces are, to a degree, predictable, the general flux in the lower atmosphere up to a few hundred meters above the ground is independent of the inversion surface. At Lacq the number of days with an atmospheric inversion was far less than the number of days when pollution damage occurred. The pollution damage distribution was correlated with pertinent meteorological data to show whether all pollution damage could be attributed to atmospheric inversions or increased atmospheric stability. Major damage occurred when the inversion surface was at an altitude of 220 to 400 m, when the wind was feeble and of constant direction and when no front passed over the region overnight; damage also occurred when atmospheric stability prevailed to an altitude of 380 m with isothermic or a slightly negative temperature gradient. Rapid dilution of pollution takes place when an above ground wind velocity of three m/s of variable direction occurs with the passage of weather fronts during the night.

14465 APTIC NO. 32133

Cadle, Richard D.

RATES OF CHEMICAL REACTIONS IN THE SUBIONIC ATMOSPHERE. *J. Geophys. Res., 68(13):3977-3986, July 1, 1963. 48 refs.*

Most chemical reactions in the region between the ionosphere and the tropopause involve oxygen atoms. The most thoroughly studied atmospheric reaction involving oxygen atoms is that with molecular oxygen to form ozone. Other reactions of importance are with methane, nitric oxide, nitrogen dioxide, sulfur dioxide, hydrogen sulfide, ammonia, and a large number of organic compounds. Next to atomic oxygen, ozone is probably the most important reactant between the ionosphere and the tropopause. It reacts very rapidly with NO and also with NO2, H2S, and various organic compounds. Various photochemical reactions also must occur in this region. Ozone, despite its low concentration, may be the main reactant in the natural troposphere. Other reactions of importance in the troposphere are those with NO2 with NO and water to form nitrous acid, of NO2 and water to form nitric acid, and various reactions between gases and airborne particles. (Author abstract modified)

14466 APTIC NO. 32361

Cadle, Richard D.

THE ROLE OF NITROGEN OXIDES FROM AUTOMOBILES IN SMOG. *Am. Astronautical Soc. Sci. Technol. Ser., vol. 22:429-435, 1969. (Presented at the American Astronautical Society, Annual Meeting, 15th and Operations Research Society, Annual Meeting, 35th, Denver, Colo., June 17-20, 1969.)*

Nitrogen oxides are particularly important in the formation of photochemical smog. Two of the oxides of nitrogen are especially important, namely nitric oxide and nitrogen dioxide. When first emitted to the air, the oxides of nitrogen consist largely of nitric oxide but in photochemical smog the nitric oxide is rapidly converted to nitrogen dioxide, which, in turn, absorbs sunlight and triggers the chemical reactions that produce smog. The oxides of nitrogen participate in reactions forming objectionable organic nitrogen compounds. The oxides of nitrogen are emitted from automobiles and various other combustion processes. Almost all of the nitrogen oxide is produced by nitrogen fixation. Various methods for preventing the formation of oxides of nitrogen by fixation were discussed. Finally, the question of the extent to which pollution must be reduced in a given urban region so that it will not be apparent is considered. (Author abstract modified)

14467 APTIC NO. 32132

Carpenter, S. B., J. M. Leavitt, Fred W. Thomas, John A. Frizzola, and Maynard E. Smith

FULL-SCALE STUDY OF PLUME RISE AT LARGE COAL-FIRED ELECTRIC GENERATING STATIONS. *J. Air Pollution Control Assoc., 18(7): 458-465, July 1968. 9 refs.*

Plume rise data were collected at six coal-fired, steam-electric generating stations within the TVA system over a two-year period. Unit ratings ranged from 173 to 704 Mw; stack heights varied from 250 to 600 ft. An instrumented helicopter and special photographic equipment were used to obtain 1580 separate plume observations and significant related meteorological parameters during stable, neutral, and slightly unstable conditions. The 1580 observations were resolved and consolidated into 133 composite observation periods covering 30 to 120 min. Meteorological parameters and other compiled input data were entered into four principal equations for calculation of plume rise, and calculated plume rise values were compared with observed values. Most equations overestimated plume rise in low wind speed. For moderately high speeds, the Carson and Moses and the Concawe equations gave best fit. (Author abstract modified)

14468 APTIC NO. 31755

arter, Raymond P. and Constantine J. Gregory

A MATHEMATICAL DIFFUSION MODEL WITH RESPECT TO A MOVING AIRCRAFT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1971. 4 refs. (Presented at the Air Pollution Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-129.)*

A computer-solved atmospheric dispersion model was developed to predict the total ground-level concentration of a pollutant resulting from both airborne and/or ground-operated aircraft operations. The model accounts for wind speed, time of exposure, height of release, rate of emission, atmospheric stability, and velocity and direction of the aircraft. The input time dependent factor can be varied over any interval up to and including the time of lift-off and climb-out. The equations for the take-off or landing phase of aircraft operation and for the climb-out or approach phases are presented. The ultimate use of the model is to assist in determining the location of new airports and to evaluate its effects as a potential source of pollution on the environment. Although the model was developed with aircraft emission in mind, it can be modified to include other types of moving sources. (Author abstract modified)

14469 APTIC NO. 31895

Colacino, M., A. Guerrini, and F. M. Vivona

AIR POLLUTION AND CLIMATE. *(Inquinamento atmosferico e clima). Text in Italian. Geofis Meteorol., 19(5-6):139-142, Sept.-Dec. 1970. 10 refs.*

According to a review of the literature, air pollutants modify not only the chemical composition of the atmosphere, but also its thermodynamic equilibrium. High levels of solid particulate matter in the air result in an increase of local temperature, appearance of artificial condensation nuclei, and subsequent changes in the degree and nature of precipitation. The present trend towards increased solid particulate levels in the urban air is best illustrated by the increased urban levels of aerosols (originated by the combustion of gasoline in automobiles) over those above the sea or in the mountains. Furthermore, as compared to 1967, the level of lead in the air of some American cities has increased by 50%. Carbon dioxide levels also affect climate. It has been estimated that if the levels of carbon dioxide continue to increase at the present rate, the average daily temperature of the earth in the year 2000 should increase by 0.8 C with respect to the year 1900. Recent observations have shown that, as compared to rural areas, the urban environment shows higher temperatures, cloudiness, precipitation, and lower relative humidity and sunlight. The high density of buildings and population, pavement, and heating plants also affect the climate of urban areas.

14470 APTIC NO. 32155

Corn, Morton

NONVIABLE PARTICLES IN THE AIR. *In: Air Pollution. Arthur C. Stern (ed.), vol. 1, 2nd ed., New York, Academic Press, 1968, Chapt. 3, p. 47-94. 141 refs.*

Dispersion of aerosols such as mists, dusts, and smoke are described with regard to size, properties, types of gas cleaning equipment, typical particles, methods for particle size analysis, terminal gravitational settling, and particle diffusion coefficient. Common atmospheric dispersoids are smog, clouds, fog, mist, rain, and haze. A frequency distribution curve can be obtained mathematically for determination of the light scattering properties of particles. Mathematical models are used to describe particle size and shape. Particle motion in the atmosphere is also discussed including sedimentation, brownian motion, diffusion, and coagulation. Particles have a size distribution from .00006 micron to 20 micron. Air also contains ions formed from solar and cosmic radiation and from radioactive materials present in the atmosphere and ground. They can be measured by an electrometer. Ion concentration varies with the seasons and weather. A strong correlation exists between atmospheric lead concentration (indicative of automobile exhaust) and large ion concentration. Particles smaller than 0.1 micron are called Aitken nuclei and can facilitate the condensation of vapor. Larger molecules can also facilitate cloud formation. The complete size distribution of particles can be obtained by combining Aitken Nuclei counts (obtained with a recording condensation nuclei detector) and larger particle counts (obtained with an impactor sampler), by sedimentation, by membrane filters, by electron microscopes, or by other methods. Particles can be composed of sulfates, sulfuric acid, lead, or many other substances. Particle size distributions and concentrations have been measured in many areas. Also, area surveys have been set up such as the British National Survey of Air Pollution and the American National Air Sampling Network. Dust fall, suspended particulate matter and the staining or soiling index are discussed in detail with data for various cities. Smoke, organic compounds, collection techniques, and many other aspects are also mentioned.

14471 APTIC NO. 31838

Dinkun, P. P., L. M. Shabad, and V. L. Norkin

SOME NEW DATA ON POLLUTION OF THE ATMOSPHERE OF INDUSTRIAL CITIES BY 3,4--BENZOPYRENE. *(Nekotorye novye dannye o zagryaznennosti atmosfery promyshlennykh gorodov 3,4-benzpirenom). Gigiena i Sanit., 21(1):6-11, 1956. 10 refs. Translated from Russian by Paul V. DePorte, National Institutes of Health, Bethesda, Md., 15p., July 3, 1956. (Presented at the Vsesoyuznoy Konferentsii po Voprosam Gigieny Vozdukha, Sanitarnoy Bakteriologii i Gigieny Vody, May 16-20, 1955.)*

All the snow that accumulated on a given area (0.25 to 2 sq m) in and around Leningrad within a one to three-month period was tested for the presence of 3,4-benzopyrene. Open places not less than 10 m from public roads or buildings with a uniform layer of snow were chosen for sampling. The tarry residues were analyzed by a three-stage method consisting of chromatographic fractionation, study of the fluorescence spectra, and spectrophotometric determination of the amount of 3,4-benzopyrene in the fractions. The results indicated the amount of 3,4-benzopyrene in the fractions. The results indicated the amount of 3,4-benzopyrene discharged by industrial plants and heating systems. Snow samples were also taken at distances of 300, 1000, 1800, and 2500 m from a large isolated plant near Leningrad. The amount of 3,4-benzopyrene discovered in the samples decreased comparatively rapidly with increasing distance from the plant. At a distance of 2500 m, in snow that had accumulated after two and one-half months, 0.01 mg of 3,4-benzopyrene was found on an area of 1 sq m. Snow samples were collected from 26 places in the center of Leningrad and in industrial regions on the outskirts. Results of samplings on Kamennon Island were used as a standard. During a period of half a year, approximately 0.2 mg of 3,4-benzopyrene per sq m of surface area accumulated. Samples collected in various parts of the city did not vary greatly, and in the majority of cases, did not exceed greatly the amount of 3,4-benzopyrene found on Kamennon Island; no places were found in other parts of the city where the amount of 3,4-benzopyrene was less. Projected results indicated that certain amounts of carcinogenic substances spread over a considerable distance from their point of origin. Assuming that the discharge of 3,4-benzopyrene from heating systems during the winter is uniform, and that the heating season lasts for not less than six months, not less than 200 g falls on the surface of the city in this time. Other additional sources could increase the amount of 3,4-benzopyrene within this same time period to tens of kilograms. Complete data on collected samples are included. Some questions are raised on the possible links between carcinogenics and lung cancer, citing cases of occupational cancer produced by soot, coal tar, pitch, and lubricating oils, causing malignant tumors.

14472 APTIC NO. 32137

Eriksson, Erik

THE YEARLY CIRCULATION OF SULFUR IN NATURE. *J. Geophys. Res., 68(13):4001-4008, July 1, 1963. 13 refs.*

Though the circulation of sulfur in nature is more complicated and extensive than was realized earlier, it is possible to represent it in a semiquantitative way. The total amount passing through the atmosphere is 365 million tons/yr. The industrial emission at present makes up only 11% of the total. Sulfur lost in precipitation need not balance all of the sulfur that is brought into the atmosphere from various sources, because absorption by soils and plants takes place. Industrial sulfur precipitation over land need not show up in river water. After precipitation it may be released by hydrogen sulfide and carried out over the oceans before being reprecipitated into a different form. River--water sulfur, weathering and fertilizer sulfur, precipitation, dry deposition of sulfur, biological turnover of sulfur in the sea and sedimentation of sulfur in the sea are parts of the circulation pattern of sulfur. The importance of the biosphere, both the oceans and on land, is that the circulation of sulfur that yearly passes through the atmosphere seems to be about ten times as great as industrially released sulfur.

14473 APTIC NO. 32135

Fonselius, Stig H.

HYDROGEN SULFIDE BASINS AND A STAGNANT PERIOD IN THE BALTIC SEA. *J. Geophys. Res., 68(13):4009-4016, July 1, 1963. 10 refs.*

The main properties of stagnant basins in the oceans and great seas are described and examples are given. One requirement of stagnant basins is a difference in density between the surface water and the deep water; another is that the basin be isolated from the main water mass by narrow and shallow straits, which prevent free exchange of water. The best known example of a stagnant sea is the Black Sea, where only the surface water down to 200 meters contains oxygen. The main part of the water mass is stagnant and contains large amounts of hydrogen sulfide. The reasons for the beginning of stagnation and for the final turnover of the bottom water are given. The chemical conditions are described and the ratio of total redox reactants to the phosphate concentration in different basins is discussed. It is frequently suggested that hydrogen sulfide is released from the sea surface to the atmosphere. The source of the H2S cannot be stagnant basins in the oceans and the great seas. The H2S is to well isolated by a thick layer of oxygen-rich surface water, the accumulated amount of sulfur is too small, and the stagnant basins are too few to be able to supply the atmosphere with the large amount of sulfur required. A previously unknown process at the sea surface must be the source for this marine H2S.

14474 APTIC NO. 32228

Gartrell, F. E., F. W. Thomas, and S. B. Carpenter

AN INTERIM REPORT ON FULL-SCALE STUDY OF DISPERSION OF STACK GASES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 7p., 1960. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 53rd, Cincinnati, Ohio, May 22-26, 1960, Paper 60-43.)*

A full-scale study of the dispersion of stack gases from large coal-burning power plants was initiated in 1957. Extensive use was made of automatic stationary recording sulfur dioxide samplers and Thomas autometers to monitor ground concentrations. Complete meteorological stations and operational information provided basic data for applying the classic diffusion equations in estimating both levels and frequency of concentrations at selected locations. To supplement data, a portable model Titrilog was adapted for mobile operation in a helicopter. The pilot followed a prescribed flight course, usually downwind or upwind in the center of the plume. Principal meteorological models proposed for study included inversion, coning plume in high-wind conditions, and looping plume in low to moderate wind conditions. Data from the sampling of eight inversion plumes, along with the results of preliminary analyses of these data, are presented. Apparent losses of SO2 from the plume with time and distance from the source are cited. Preliminary investigations of this finding by controlled dilution and cooling of the flue gas pointed to oxidation of SO2 as a possible explanation.

14475 APTIC NO. 32141

Georgh, Hans-Walter

OXIDES OF NITROGEN AND AMMONIA IN THE ATMOSPHERE. *J. Geophys. Res., 68(13):3963-3970, July 1, 1963. 30 refs.*

Nitrogen oxides and ammonia play an important role among the atmospheric trace gases. From the eight oxides of nitrogen known, only nitrous oxide, nitrogen dioxide, and, under certain conditions, nitric oxide are detected in the atmosphere. Distribution, concentration, and possible sources and sinks of these gases are discussed. Possible reactions taking place with other gaseous components in the atmosphere were suggested. Particular emphasis was placed on the tropospheric budget of these gases. The possible effect of atmospheric electrical processes was discussed with respect to nitrogen dioxide production. From simultaneous measurements of gaseous and particulate compounds, as well as from chemical analyses of rain water, conclusions were drawn on the importance of trace gases for aerosol and precipitation chemistry. This evidence was supported by experimental studies on the fixation of nitrogen dioxide in rain water. A survey of the major sources and sinks of gaseous nitrogen oxides and ammonia in different layers of the atmosphere was given. (Author abstract modified)

14476 APTIC NO. 32221

Gross, Gerardo Wolfgang

ELECTRICAL PROPERTIES OF ICE. (FINAL REPORT). *New Mexico Inst. of Mining and Technology, Socorro, Office of Naval Research Contract NONR-815(05), Proj. NR 082-094, 26p., Dec. 1970. 22 refs.*

NTIS, DDC: AD 718359

An experimental and phenomenological study was made of the charge separation at the advancing surface of growing ice (Workman-Reynolds effect). The charge separation is fundamentally ascribed to anions and cations of an electrolyte solute crossing the phase boundary at different rates. The sign of the charge on the ice is determined by the preferentially incorporated ion constituent. The magnitude is determined by solute species, solute concentrations, and freezing rate. The process is very sensitive to hydrogen-ion concentration. Solutes widely present in meteoric waters (ammonium, bicarbonate, sodium, and chloride) give rise to large charge separations. Interference of different solute species with each other, either increasing or decreasing charge separation, is of importance in considering possible effects of this process on natural electrification phenomena. In addition to being a primary source of electrification, electrochemical solution partitioning at the advancing surface of a growing ice particle may affect other electrification processes involving ice, because trace impurities alter electrical properties of ice, such as conductivity, polarizability, and dielectric dispersion. Although the present results suggest that water free of impurities will not show appreciable charge separation upon freezing, this question, of paramount importance for an understanding of cloud processes, required further investigation. (Author abstract modified)

14477 APTIC NO. 31844

Hall, F. P., Jr. and Richard R. Hagan

A PRELIMINARY CAST STUDY OF LONG DISTANCE TRANSPORT OF AIR POLLUTION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1971. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-130.)*

The circumstances which resulted in a restriction of visibility caused by haze in central Oklahoma in August, 1970 were studied; investigation was facilitated because the mass of pollution was carried into an area having lower than average sources of industrial air pollution. The synoptic situation was characterized by a large high pressure cell over the Great Lakes and a low pressure system which moved from Colorado to the southeast. Due to a lack of adequate air sampling data, visibility reports were used to analyze the progress of this pollution mass from an area centered in Ohio through Kansas, Oklahoma and north Texas. To estimate parcel paths, 850 millibar constant pressure trajectories were used. Suspended particulate measurements from Tulsa, Dallas, and Forth Worth were used to verify that pollution was responsible for the visibility reductions. The appearance of the pollution on three radars is reported. It is concluded that large concentrations of air pollution were transported more than 500 miles from the source. The concentrations in Oklahoma and north Texas reached anomalously high values due to a steady air flow through a source region to an impact area. Meteorological visibilities were an effective tool in this study. (Author abstract modified)

14478 APTIC NO. 32020

Hamburg, Frederic C.

URBAN MODEL IMPROVEMENT BY INPUT OF REPRESENTATIVE, NON-ZERO STACK HEIGHT WINDS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1971. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-93.)*

In computations of long-term average pollutant concentrations, cases of calm or light winds overshadow all others due to the appearance of wind speed in the denominator of plume rise and dispersion equations. To improve predictions obtained by analyses using the Martin multiple source urban model, a methodology for adjusting input data was developed. The technique focuses upon two related major sources of error: near-zero wind speeds, and non-representativeness of airport wind data. From published three hourly surface observations for Louisville, Ky., during December, 1969 and January and February, 1970, comparison with concurrent twice-daily pilot balloon observations showed that in 33 cases of zero or light surface winds, wind speed shear to the 150 meter standard level averaged 3.8 knots. In six cases of surface calm, wind speed at 150 m averaged over 10 knots. During periods of calm or light winds, mesoanalysis indicated a tendency for southwesterly flow aloft when the high center or ridge lay south of the city, and for northeasterly flow when the system lay north of the city. With added support from topographic considerations, fragmentary urban wind reports, and local aviation weather forecasting rules, a set of assumptions for non-zero, representative winds at effective stack height was established. Using a modified 480-point frequency distribution of wind direction, wind speed, and atmospheric stability category, urban model predictions showed substantial improvement over predictions based on unadjusted wind data. Plots of observed versus predicted average ground level concentrations of sulfur dioxide based on modified winds exhibited much scatter, with correlation coefficients between 0.5 and 0.6; however, results based upon unadjusted airport surface winds were patently too erroneous even to merit statistical evaluation. (Author abstract)

14479 APTIC NO. 32255

Heck, Werner J.

RELATIONSHIP OF WIND VELOCITY AND STABILITY TO SO2 CONCENTRATIONS AT SALT LAKE CITY, UTAH. *National Oceanic and Atmospheric Administration, Salt Lake City, Utah, Scientific Services Div., NOAA NWSTM WR-61, 21p., Jan. 1971. 2 refs.*

NTIS: COM-71-00232

Air pollution, with special attention to sulfur dioxide, is discussed for Salt Lake City, Utah. Continuous sources of SO2 emission were a copper smelter, located 15 miles west of the city, oil refineries, five miles to the north, steel refineries, 30 miles to the south, and motor vehicles within the metropolitan area. Intermittent sources included the burning of tires, oil, and scrap automobiles in dumps around the city. The relationship between wind velocities and SO2 concentrations during late fall and winter and a high pollution episode for the relationship between day-to-day SO2 concentrations and mixing depth were studied. Sulfur dioxide concentrations increased rapidly in downtown Salt Lake City during morning hours with the transition from south-southeast drainage winds to north-northwest up-valley winds. Pollutants were sufficiently diffused throughout the afternoon so as not to produce another SO2 maximum with the transition back to the drainage wind in the early evening. A north-northwest wind was not, however, necessary for a rapid increase of hourly SO2 concentrations. Sulfur dioxide concentrations increased significantly under a stagnant high-pressure system with rapidly decreasing mixing depths. Winds were an important factor in the increase of hourly SO2 concentrations, while the mixing depth affected the increase of average daily SO2 concentrations.

14480 APTIC NO. 31741

Hilst, Glenn R.

ELEVATION OF TRACER CLOUD OVER AN URBAN AREA. *National Air Pollution Control Administration, Research Triangle Park, N. C. and North Carolina Consortium on Air Pollution, Proc. Symp. Multiple-Source Urban Diffusion Models, Chapel Hill, N. C., 1969, p. 8.1-8.40, 14.5-14.6. 7 refs. (Oct. 27-30.) (APCO Pub. AP-86)*

NTIS: PB 198400

A single case study is utilized to test the sensitivity of the Travelers Research Corporation Regional Model to random and systematic errors in the source-strength input and to systematic errors in the remaining input variables. Random errors in the source strengths do not produce comparable errors in the air quality prediction. Beyond this, and in order of decreasing sensitivity, the TRC model has been found to be highly sensitive to systematic regional wind-direction errors and moderately sensitive to systematic errors in source-strength estimates, decay or loss rates, and vertical diffusion rates. The model is insensitive to errors in lateral diffustion rates, at least for the multiple-source distribution encountered in Connecticut. These sensitivites are quantified for the case studied. The case used for the sensitivity analyses also provided an opportunity to determine the effect of changes in the input variables on the verification of the model, since observations of sulfur dioxide were available from the verification program. Significant improvements in the TRC model verification, over that obtained from the original, independantly chosen, input variables, were found when either the source strengths or the decay or loss rates were adjusted appropriately. This result suggests the need for much better understanding of the decay and loss of airborne SO2. (Author abstract)

14481 APTIC NO. 32000

Hirt, M. S., L. Shenfeld, G. Lee, H. Whaley, and S. Djurfors

A STUDY OF THE METEOROLOGICAL CONDITIONS WHICH DEVELOPED A CLASSIC FUMIGATION INLAND FROM A LARGE LAKE SHORELINE SOURCE. *Preprint, Air pollution Control Assoc., Pittsburgh, Pa., 31p., 1971. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-132.)*

The change in meteorological conditions and associated air quality both at ground level and aloft from just prior to sunrise, when a stable atmosphere and low ground level pollutant concentrations existed, to the early afternoon of the same day when solar heating resulted in the development of a classic inversion fumigation condition for a period of a few hours, is described. Temperature and wind profiles were obtained using specifically designed, battery operated radiosonde receivers with slow rise balloons. The spatial distribution of sulfur dioxide concentrations was obtained utilizing two automobiles and a helicopter each instrumented with a continuous rapid response analyzer. The plume was measured to rise to a level at which an intensification of an inversion was noted. Average ground level concentrations as high as 0.90 ppm were measured at a distance of 6 km from the source during the inversion fumigation. The measured concentrations compared well with predictions using established formulae. (Author abstract modified)

14482 APTIC NO. 32185

Hogstrom, Ulf

METEOROLOGICAL-STATISTICAL ASPECTS. *In: Recommendations Relating to Norms for Sulfur Dioxide Content in Open Air. (Rekommendationer rorande riktvarden for svaveldioxidhalt i utomhusluft). Swedish Government Air Pollution Board, Stockholm, Communication 6601, 1965 (?). Translated from Swedish by Scientific Translation Service, Inc., Santa Barbara, Calif., p. 20-26, 1967.*

A hypothetical continuous recording of an atmospheric impurity component is shown schematically. However, continuously recording measuring instruments frequently are not available. Instead, successive samples are taken, each sample giving an average value for a given period. The longer the sampling time, the more effectively the contrasts are evened out since the extreme concentration values become increasingly rare as sampling time increases. Cumulative frequency distribution curves of atmospheric impurity measurements do not permit indication of an absolutely highest concentration that has never been exceeded. For a norm or recommendation to be meaningful, it must include information on maximum concentration, cumulative percentage, and sampling time. The atmospheric pollution observed at a given measuring station may be due to one or a few large point sources, or to widely scattered smaller sources. At stations where one large point source is strongly dominant, the readings show shorter periods with relatively high concentration peaks distributed among long periods with long pollution content. When scattered sources predominate there are generally fewer contrasts.

14483 APTIC NO. 32149

Johnson, Warren B. and Edward E. Uthe

LIDAR OBSERVATIONS OF THE LOWER TROPOSPHERE DURING BOMEX. (INTERIM REPORT). *Stanford Research Inst., Menlo Park, Calif., Aerophysics Lab., AEC Contract AT(04-3)-115, SRI Proj. 7929, Proj. Agreement 83, 49p., Dec. 1969. 9 refs.*

NTIS: TID-25532

A Mark V lidar was flown on an USAF WC-130B aircraft over the Barbados Oceanographic and Meteorological Experiment array during the third experimental period (20 June to 3 July 1969). The instrument used a neodymium laser (1.06 micron wavelength) and had a firing rate of approximately one pulse per 3.5 seconds. A total of 5192 lidar signatures were collected during the eight flight missions. Most of the observations were obtained over the eastern portion of the BOMEX area at an altitude of 10,000 ft and an aircraft speed of 100 m/s, with a lidar pointing angle of 60 deg below the horizon. A computer technique is described that adjusts and corrects the data for the range effect, instrumentation nonlinearities, and pulse-to-pulse variations in transmitted energy, and then objectively performs a contour analysis of the resulting data matrix. A number of vertical cross sections obtained in this way, and the associated average vertical profiles are presented. The results are interpreted qualitatively in terms of changes in aerosol density and/or particle size in the lowest 3000 m of the troposphere. The first data to be analyzed clearly reveal the existence fo well defined haze layers associated with the subcloud layer and with trade-wind inversion. Within the cloud layers, the clean air between clouds typically gives less signal return, indicating cleaner or drier air. All runs analyzed thus far indicate increasing signal return above the height of the minimum return associated with the trade-wind inversion. (Author abstract modified)

14484 APTIC NO. 32428

Kahan, Archie M.

WEATHER MODIFICATION EFFECTS ON MAN S ENVIRONMENT. *Western Resource Papers, 1967:81-89.*

Possible air and water pollution effects of cloud seeding materials are considered. Data are presented that compare silver concentrations in treated air and in the subsequent precipitation with acceptable levels. These concentrations are several orders of magnitude lower than the maximum tolerance levels for both air and water. Relative concentrations of other seeding materials are also presented. Fog dispersal techniques in France near Orly Airport resulted in a small amount of snow; however, signs warning of icy roads during fog dispersal operations effectively reduced accidents. It has been suggested that weather modification may increase flood hazards and decrease downwind precipitation, but careful monitoring of seeding activities reduces flood hazards. Also, evidence shows a beneficial increase in downwind precipitation. Operations for lightning suppression in areas susceptible to forest fires will have little effect on precipitation because the associated storms are typically high-level dry thunderstorms. Results of high-suppression activities, while as yet inconclusive, suggest that seeding may actually increase useful precipitation. (Author introduction modified)

14485 APTIC NO. 32362

Kenline, Paul A. and P. V. Scarpino

BACTERIAL AIR POLLUTION FROM SEWAGE TREATMENT PLANTS. *Preprint, Air Pollution Control Office, Cincinnati, Ohio, Div. of Health Effects Research, 18p., May 1971. 11 refs.*

Data on the numbers and types of bacteria emitted into the air from activated sludge and extended aeration sewage treatment plants were reported and the fate of the airborne bacteria in the atmosphere was evaluated. A dispersion model was developed to relate airborne bacterial concentrations to the emission rate of bacteria from the sewage into the air. This dispersion model accounted for the depletion of the bacterial cloud by the mechanisms of atmospheric diffusion, deposition, and die-off. Data on bacterial concentration were analyzed by use of the dispersion equation to evaluate the fate of airborne bacteria, and to determine the persistence of the bacterial cloud. The mean bacterial emission rate was 440 bacteria/sq m/sec. Volumetric concentration of airborne bacteria was depleted primarily by atmospheric diffusion and by die-off. Deposition of the bacteria to ghe ground was less important. The average half-life of the bacteria was 14 secs. Under average conditions, the initial bacterial concentration was reduced by 90% 100 feet downwind of the source. Of the bacteria collected and cultured on Trypticase Soy Agar, only five percent belonged to the Enterobacteriaceae, and these were primarily Klebsiella, Aerobacter, and Escherichia.

14486 APTIC NO. 31765

Koepf, G., J. Riegl, and W. Leeb

OPTICAL SIGNAL TRANSMISSION STUDIES (LASER). *(Untersuchungen zur optischen Nachrichtentechnik (Laser)). Text in German. Technische Hochschule, Vienna (Austria) Inst. fuer Hochfrequenztechnik, Proj. 702, Rept. ON 3, 128p., Sept. 1970. 216 refs.*

NTIS: N71-14349

The Helium-Cadmium Laser Discharge Tube study contains an outline of the mode of operation of the laser by cataphoresis, a description of the construction of the He-Cd-laser, and a description of measurements performed with the laser. The preliminary study of the construction of a laser cloud altitude meter analyzes the scatter of laser rays in the atmosphere. (transmission in the atmosphere, the aerosol (MIE) scattering, and the backscatter from clouds), and the optical radar or lidar (light detection and ranging) (the lidar equation, construction of a cloud altitude meter, and the selection of recording parameters of a cloud altitude meter). The study on optical frequency filtration and signal identification, an analogy of the filtration of electrical signals in communications technology, deals with Fourier s transformation of two-dimensional horizontal field distributions, with spatial frequency filtration, and with identification of signals. The study on the optimization of resonator adjustment in CO2 lasers deals with achieving maximal CO2 laser action with discharge current at a minimum. The study of the directional characteristics of a photoreceiver following the impact of a laser ray lays out a program for the numerical calculation of an output signal of a photoresistance. The study on photoreceivers for the infrared spectrum contains a description of the optical and electronic components of a radiation measuring instrument of high accuracy.

14487 APTIC NO. 31845

Levy, Arthur, William E. Wilson, Jr., and Salo E. Miller

PHOTOCHEMICAL SMOG - PROBLEMS IN DEFINING REACTIVITY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 43p., 1971. 20 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-38.)*

Recent criteria developed for hydrocarbons, nitrogen oxides, and oxidants in relation to current information on photochemical smog reactivity are discussed and reactivity is examined in relation to laboratory smog profiles, considering the intermediate rate parameters in the smog reaction and the final end products. Hydrocarbon reactivity is categorized for a number of hydrocarbons, showing how reactivity can differ, depending on the aspect considered. Many factors contribute to smog reactivity, including: meteorology; light intensity; sulfur dioxide; particulate, carbon monoxide, water vapor, hydrocarbon mixtures; and hydrocarbon,nitric oxide ratio. Meteorological influences are important in terms of temperature effects, wind flushing, inversions, and rain. It has been shown that increasing light intensity results in faster kinetics, although not necessarily increased product yield. The role of SO2 is reviewed, showing some of the complex relationships among SO2, humidity, and hydrocarbon structure. The accelerating effects of CO and NO2, the role of the hydroxyl radical, and the synergistic effect of hydrocarbons mixtures are also discussed. (Author abstract modified)

14488 APTIC NO. 31792

Manowitz, Bernard, Maynard E. Smith, Leonard Newman, Meyer Steinberg, and Walter D. Tucker

AN ISOTOPE RATIO METHOD FOR TRACING ATMOSPHERIC SULPHUR POLLUTANTS. *Chem. Eng. Progr. Symp. Ser., 66(104):163-174, 1971. 2 refs.*

The necessary elements for a practical method of utilizing differences in stable isotope ratios for tracing sulfur (especially sulfur dioxide) in the atmosphere have been developed. These include means of efficiently collecting adequate size samples rapidly, procedures for processing the samples to sulfur dioxide and purifying them without fractionation of the isotopes, procurement and operation of a double-beam isotope-ratio mass spectrometer that can measure sulfur-32/sulfur-34 ratios with a precision of plus or minus 0.02%, and the location of fuels with sulfur contents and isotope ratios that make possible their use as tracer fuels. The isotope ratio tracer technique is being applied to the study of the chemical and physical changes that take place in sulfur compounds in the plumes from power plant stacks and the study of the behavior of the plumes themselves. (Author summary modified)

14489 APTIC NO. 32136

Mijake, Yasuo and Shizuo Tsunogai

EVAPORATION OF THE IODINE FROM THE OCEAN. *J. Geophys. Res., 68(13):3989-3993, July 1, 1963. 13 refs.*

To understand the enrichment of iodine relative to chlorine and bromine, experiments were performed to examine the possibility of free evaporation of iodine from the surface of sea water. Air with a temperature of 20-35 C was passed slowly over the surface of 10-15 l of saline or sea water of the same temperature. The air was then passed through bottles containing absorbing alkaline solutions and through a reflux condenser or concentrated sulfuric acid to absorb iodine and to trap water vapor. The iodine content in the absorber and in the condensed water was determined by spectrophotometry and a radiometric method with iodine-131 as the tracer. The experimental results showed that iodine can vaporize, because the oxidation of iodide ions produces free iodine in sea water under irradiation by solar light of wavelengths up to about 560 millimicron. On the basis of these results, the rate of iodine escape can be estimated to be four times 10 to the 11th g/yr for the whole ocean surface. This value is in fairly good agreement with the global rate of iodine deposition in rain.

14490 APTIC NO. 32143

Moeller, F.

ON THE INFLUENCE OF CHANGES IN THE CO2 CONCENTRATION IN AIR ON THE RADIATION BALANCE OF THE EARTH S SURFACE AND ON THE CLIMATE. *J. Geophys. Res., 68(13):3877-3886, July 1, 1963. 20 refs.*

The numerical value of a temperature change under the influence of a carbon dioxide change as calculated by Plass is valid only for a dry atmosphere. Overlapping of the absorption bands of CO2 and water in the range around 15 micron essentially diminishes the temperature changes. New calculations give a temperature change of 1.5 deg when the CO2 content increases from 300 to 600 ppm. Cloudiness diminished the radiation effects but not the temperature changes, because under cloudy skies larger temperature changes are needed in order to compensate for an equal change in the downward long-wave radiation. The increase in the water vapor content of the atmosphere with rising temperature causes a self-amplification effect which results in almost arbitrary temperature changes. The changed radiation conditions are not necessarily compensated for by a temperature change. The effect of an increase in CO2 from 300 to 330 ppm can be compensated for completely by a change in the water vapor content by three percent or by a change in the cloudiness by one percent of its value without the occurrence of temperature changes at all. Thus, the theory that climatic variations are effected by variations in the CO2 content becomes questionable. (Author abstract modified)

14491 APTIC NO. 31852

Nathans, Marcel W. and Gordon J. Stopps

GLOBAL EFFECTS OF LEAD CONTAINING POLLUTANTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 31p., 1971. 20 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-116.)*

The magnitude of the lead contamination of the earth s surface caused by lead-containing particulates introduced into the atmosphere was estimated. The tops and bottoms of a number of 3-ft long soil cores from Norway, India, and Peru were analyzed by mass spectrometry for total lead and lead isotopic composition. With the exception of, the cores from Norway, the surface layers had the same or a lower lead concentration than the deep layers, indicating that the global effects of lead pollution were not measurable in soils within the composition variability of the lead concentration in the soil and that caused by experimental error. This conclusion was confirmed by the isotopic composition data; the isotopic composition of the lead in the soils appears to be more consistent with that of trace lead in rocks than with that of lead in ores. Estimates of the amount of lead emitted by pollution sources and deposited globally are included. These figures indicate that, as yet, insignificant amounts of lead are added to the surface of the earth at large distances from the sources. (Author abstract modified)

14492 APTIC NO. 32150

Ogden, Eugene C., Gilbert S. Raynor and Janet V. Hayes

TRAVELS OF AIRBORNE POLLEN. *New York State Museum and Science Service, Albany, APCO Research Grant AP-81, Progr. Rept. 11, 25p., Feb. 1971. 9 refs.*

A light aircraft-mounted isokinetic sampler was developed for use in planned future studies of pollen transport and dispersion over distances of 100 miles and altitudes to 10,000 feet. The major improvement in the mobile tower sampling assemblage was the addition of instrumentation to allow the average daily pollen concentration data from four heights to be on a calendar day basis. This was effected by removing the old style intermittent rotoslides and placing two swing-shield rotoslide samplers at each of the four and placing two swing-shield rotoslide samplers at each of the four levels. Each one of the pair operates on alternate days and is idle on the other days. A 24-hour timer removes electric power from one of each pair and activates power to thyother at midnight. Numerous tests were conducted during the development of the aircraft isokinetic sampler to determine the best specifications for various components and to select the optimum entrance size, filter type, and method of controlling and monitoring the flow rate. Additional tests were performed to determine the best methods for handling the samples taken by the sampler. Additional efficiency tests of the automatic grab sampler were made. Filter head entrance efficiency test results were published. Analysis of point and area source ragweed pollen dispersion data was completed, as well as analysis of timothy pollen dispersion data. An analysis of the corn pollen dispersion data is ready for publication. Collection of wind, temperature, and humidity data from the forest continued during much of the period. Prediction of ragweed pollen concentrations also continued, and diurnal variations in ragweed pollen concentrations were determined. Sweet fern pollen was sampled.

14493 APTIC NO. 32508

Panzram, Heinz

METEOROLOGICAL ASPECTS TO THE MAINTENANCE OF CLEAN AIR. *(Meteorologische Aspekte zur Reinhaltung der Luft). Text in German. Naturw. Rundschau., 24(9):390-392, Sept. 1971.*

During nine to 10 months of the year, the meteorological conditions in Germany favor good ventilation so that dangerous concentrations of pollutants do not occur at ground level. Temperature inversions are far more likely to occur during the winter months. When the wind speed at ground level is not more than three m/sec, temperature inversions are likely to lead to high pollutant concentrations. Numerous German universities are studying the meteorological conditions involved in air pollution; the background concentration of various gases is being measured at five stations located in unpolluted areas. A study on the dilution of automobile exhaust gases revealed that those apartments which face the street and are located leeward to the wind direction are most affected. A loose arrangement of houses is recommended for busy streets which are perpendicular to the main wind direction.

14494 APTIC NO. 32005

Plumlee, Hubert R. and Richard G. Semonin

CLOUD DROPLET COLLISION EFFICIENCY IN ELECTRIC FIELDS. *Tellus (Uppsala), 17(3):356-364, 1965. 9 refs.*

A mathematical model describing the effects of forces acting on two spherical droplets immersed in a viscous medium was described. The model includes the interaction of the droplets with an externally applied electric field. The collision of efficiencies between pairs of droplets ranging in size from five to 70 microns in radius are given as results of computations of the grazing trajectories of the smaller droplets relative to the larger drops in electric field up to 10,000 volts per cm. The collision efficiency for a given pair of droplets increases as the applied electric field increases. For example, the collision efficiency of a 30 micron drop in relation to a five micron droplet increases 34.5 times when the horizontal field is changed from one to 3600 volts per cm. Results of calculations are given to show how collision efficiencies vary as the orientation of the electric field is varied in relation to the axis of droplet motion. The results show that the maximum and minimum collision efficiencies occur with field orientations of 90 and 42 degrees respectively. (Author abstract modified)

14495 APTIC NO. 31788

Robinson, A. J. and David Barran

AIR POLLUTION. *J. Roy. Soc. Arts (London), 119(5180):505-519, July 1971. 17 refs. (Presented at the Royal Society of Arts, London England, March 22, 1971.)*

Major air pollutants as they affect the mass of the population are considered, and trends are indicated where they are known. The fate of some of the sulfur compounds, carbon monoxide, carbon dioxide, smoke, nitric oxide, and particulate matter, in the atmosphere, is reviewed. Normally a vertical temperature gradient exists in the atmosphere where temperature falls with increasing altitude. Under these conditions there is good vertical mixing, and ground level concentrations are inversely proportional to wind speed and the square of the effective height of emission. The mechanism of dispersion and the decay of pollutants with time are discussed. The current position in Great Britain is reviewed in terms of the national trends in emissions and ground level concentrations.

14496 APTIC NO. 31742

Sakuraba, Shin ichi, M. Moriguchi and I. Yamazi

SENSITIVITIES OF AIR QUALITY PREDICTION TO INPUT ERRORS AND UNCERTAINTIES. *National Air Pollution Control Administration, Research Triangle Park, N. C. and North Carolina Consortium on Air Pollution, Proc. Symp. Multiple-Source Urban Diffusion Models, Chapel Hill, N. C., 1969, p. 7.1-7.24, 14.7. (Oct. 27-30.) (APCO Pub. AP-86)*

NTIS: PB 198400

Analyses of tracer-dispersion data in Japan, especially those of vertical concentration profiles, indicate that the tracer-cloud height generally increases with the downwind distance. The increase is larger over an urban area than a rural area. When the tracer crosses over a hill, it rises remarkably. Over a complicated topography, the rise of the tracer-cloud is larger than over a flat terrain, a circumstance well reflected in the surface concentration pattern. When the tracer-cloud height varies greatly with the downwind distance, the surface concentration decreases uniformly downwind in spite of the elevated source. (Author abstract)

14497 APTIC NO. 32056

Sanberg, James S.

USE OF A VENTILATION INDEX IN AIR QUALITY CONTROL. *Preprint, California Dept. of Public Health, Berkeley, 14p., 1967. 5 refs. (Presented at the California Department of Public Health, Methods Conference, 8th, Feb. 6-8, 1967.)*

In California, the State Board of Public Health has established ambient air quality standards with carefully determined adverse levels for specific contaminants. The measures of these contaminants can be given as quotients of the quantity of pollution in the air, divided by the amount of air available to dilute and disperse it. The ventilation index gives a measure of the atmosphere s capacity to dispose of pollutants by representing the hourly rate of surface-available airflow through an arbitrary crosswind area. Using an inversion base, ventilation index values which increase as air pollution decreases have been developed. The monthly mean values of the ventilation index for five years are given. Poor ventilation occurred during the summer, and the best ventilation occurred in March and April. December had the greatest variability due to winter storms and changing weather patterns. Time of day and wind direction are also important factors. The most obvious change in distribution is the diurnal one. The ventilation index is being used to help develop pollution forecasting in conjunction with maximum mixing depth and surface temperature. Adverse oxidant days are compared with low ventilation indexes derived from morning soundings to provide a smog potential outlook and approving burning variance operations. In July, 1965, the worst predictions occurred. Thus, the ventilation index is limited due to various factors including seabreeze, advection, topography, mesometeorology, and altitude of radiosonde readings.

14498 APTIC NO. 32377

Schiermeier, F. A.

STUDY OF EFFLUENTS FROM LARGE POWER PLANTS. *Preprint. Air Pollution Control Office, Cincinnati, Ohio, Div. of Meteorology, 20p., 1971. 9 refs.*

A five-year field study was conducted in western Pennsylvania to determine the effectiveness of tall stacks in the management of air pollution from large power plants. Airborne plume measurements were obtained by an instrumented helicopter and supplemented through comprehensive ground based meteorological and air quality observations. Data were analyzed to define the meteorological conditions under which tall stack effluents are brought to the surface, the frequency of this phenomenon, and the magnitude of the resulting ground-level sulfur dioxide concentrations. Services of private contractors were engaged to provide lidar and additional helicopter measurements of plume rise; to obtain fly ash particle size distributions and turbulence measurements in the plume aloft; to determine the scavenging efficiency by natural precipitation of airborne sulfur dioxide; and to study cooling tower plume dispersion. Tall stacks help to reduce the occurrence of significant ground level sulfur dioxide concentrations that might be found with shorter stacks. In the case of the stable plume loft and subsequent inversion breakup, tall stacks somewhat reduce the resultant ground-level concentrations because of the increased lateral spread of the plume caused by wind directional shear. The frequency of inversion breakups is also reduced because the plume is frequently emitted above the height of radiation inversions caused by nocturnal cooling of the earth s surface. For a limited mixing layer, a taller stack helps slightly to reduce ground level concentrations, since the shorter the rise from the stack top to the top of the mixing layer, the greater the proportion of the plume temporarily trapped aloft and transported downwind before being lowered to the surface. In cases of high wind and neutral stability, plumes from tall stacks are subject to much greater dilution with a corresponding decrease in ground level concentrations.

14499 APTIC NO. 32436

Schneider, S. H.

A COMMENT ON CLIMATE: THE INFLUENCE OF AEROSOLS. *J. Appl. Meteorol., vol. 10:840-841, Aug. 1971. 5 refs.*

In a previous paper, it was concluded that since the backscattering and the absorption of light by certain aerosols are of comparable magnitude, then the effect of this kind of aerosol could as well be to heat as to cool the earth. The important question should not be whether the aerosol absorption is comparable to or greater than the aerosol backscatter, but rather whether the combined aerosol-surface albedo is comparable to or greater than the surface albedo alone (before the aerosol was present). The effect of an aerosol is to reduce the total solar energy absorbed in the earth-atmosphere system, even if the aerosol absorption is comparable to its backscatter.

14500 APTIC NO. 32004

Semonin, R. G. and H. R. Plumlee

COLLISION EFFICIENCY OF CHARGED CLOUD DROPLETS IN ELECTRIC FIELDS. *J. Geophys. Res., 71(18):4271-4278, Sept. 15, 1966. 11 refs.*

Collision efficiencies are shown for five- and ten-micron droplets colliding with 30-, 40-, and 50-micron drops. The charge on the drop is always positive, but the sign of the charge on the droplet is alternately positive and negative. The magnitude of the charge on the droplet extends from zero to 10 to the minus 14th coulomb. The calculations are also extended to include electric field intensities of 0, 900, 2100, and 3600 v/cm oriented at angles of 0, 90, and 180 deg with respect to the direction of fall of the drop. The electrical effects were found to influence collision efficiencies only when the droplet charges were greater than about 10 to the minus 16th coulomb or when the electric field intensity exceeded 900 v/cm. The pertinence of the calculations to the physics of electrified clouds was briefly discussed. The growth of cloud droplets to precipitation particles within clouds of free ice is dependent upon the condensation of water vapor and the rate of collisions between particles. (Author abstract modified)

14501 APTIC NO. 31743

hieh, Liau Jang, Ben Davidson, and James P. Friend

A MODEL OF DIFFUSION IN URBAN ATMOSPHERES: SO2 IN GREATER NEW YORK. *National Air Pollution Control Administration, Research Triangle Park, N. C. and North Carolina Consortium on Air Pollution, Proc. Symp. Multiple-Source Urban Diffusion Models, Chapel Hill, N. C., 1969, p. 10.1-10.39, 14.8. 31 refs. (Oct. 27-30.) (APCO Pub. AP-86)*

NTIS: PB 198400

A source-oriented three-dimensional model of diffusion and transport based upon the statistical concept of turbulent diffusion was developed for application to an urban area. A simple algorithm was found for computing the concentration field for time-dependent continuously emitting area sources of different scales. The model was applied to the New York City metropolitan region by introducing known specific meteorological conditions and the known pollutant (sulfur dioxide) source distribution as input data. The validity of the model has been verified in a preliminary manner. The results appear promising, giving concentration fields computed on spatial scales down to 0.2 mile. (Author abstract)

14502 APTIC NO. 32219

Staelin, David H.

PASSIVE REMOTE SENSING AT MICROWAVE WAVELENGTHS. *Proc. IEEE (Inst. Elec. Electron. Engrs., 57(4):427-439, April 1969. 68 refs.*

Passive remote sensing at microwave frequencies has applications which range from meteorology to oceanography and geology. The meteorological applications are the most fully developed and include measurements of the temperature profile of the atmosphere and of the atmospheric distribution of water and ozone. Such measurements can be made from space or from the ground by utilizing the microwave resonances of oxygen, H20, and 03, which occur near one cm wavelength. Although infrared observations permit similar meteorological measurements, such optical devices are much more sensitive to aerosols and clouds. The small but finite nonresonant attenuation of most moderate clouds at microwave frequencies also permits their liquid water content to be estimated. At wavelengths longer than two cm, the microwave properties of the terrestrial surface dominate observations from space, and measurements as a function of polarization and viewing angle yield information about surface temperature and emissivity. Such measurements of the ocean should also permit the sea state to be inferred. The physics of the interactions, the mathematics of data interpretation, and the instrumentation currently available were reviewed. The types, accuracy, and relevance of possible meteorological measurements were emphasized.

14503 APTIC NO. 31857

Stephens, N. T. and R. O. McCaldin

ATTENTUATION OF POWER STATION PLUMES AS DETERMINED BY INSTRUMENTED AIRCRAFT. *Preprint, Southern Research Inst., Birmingham, Ala. and Florida Univ., Gainesville, 27p., March 12, 1970. 15 refs.*

A series of investigations on the transport, diffusion, and pollutant characteristics in power station plumes as determined by instrumented aircraft were presented. Sulfur dioxide and particle concentrations were examined up to a point where they could no longer be distinguished from background values (70 km). Findings were compared with expected dispersion characteristics and a method for evaluating sulfur dioxide decay rates in the plume was tested. The particulate and sulfur dioxide concentrations found along the plume centerline were given. Minor fluctuations in concentration were attributable to variable plume concentrations in discontinuous emission puffs which persist in the diffusing plumes. Sulfur dioxide concentrations greater than 1.0 ppm were detected over 70 km from their source. This is 50 times the background or minimum detectable value, which, under these circumstances, was the same. In order to assess the decay of sulfur dioxide in the plume, it was necessary to differentiate between a decrease in concentration due to atmospheric dispersion processes and a decrease in concentration due to oxidation or other chemical or physical decay factors. The technique consisted of a comparative ratio of sulfur dioxide concentration to a conservative tracer concentration. Half-life determinations indicated that the reaction obeyed a first order rate equation. Sulfur dioxide loss rates varied from a negligible value at low relative humidity (35%) to a half-life of approximately 140 min at medium relative humidity (50%), and 70 min at high relative humidity (80%).

14504 APTIC NO. 31800

Story, Paul R., Bunge Lee, Clyde E. Bishop, Donald D. Denson, and Peter Busch

MACROCYCLIC SYNTHESIS II. CYCLOHEXANONE PEROXIDES. *J. Org. Chem., 35(9):3059-3062, Sept. 1970. 11 refs.*

The reaction of cyclohexanone with hydrogen peroxide to yield both the dimeric and trimeric cyclic peroxides was investigated. Infrared spectra were obtained with Perkin-Elmer spectrophotometers; proton magnetic resonance spectra were recorded using a Varian HA-100 spectrometer. Tricyclohexylidene peroxide was the kinetic product under most conditions, with dicyclohexylidene peroxide easily formed from it. Improved syntheses of the peroxides, particularly for the trimer, have resulted. (Author abstract modified)

14505 APTIC NO. 32360

Tanner, T. M. and L. A. Rancitelli

MULTIELEMENT ANALYSIS OF WATERS BY NEUTRON ACTIVATION. *In: Pacific Northwest Laboratory Annual Report for 1969 to the USAEC Division of Biology and Medicine. Volume II: Physical Sciences. Part 2. Radiological Sciences. Battelle Memorial Inst., Richland, Wash., Radiological Sciences Dept, p. 17, Feb. 1970.*

NTIS: BNWL-1307, Part 2

A procedure was developed which eliminates sodium(24) interference in neutron activation procedures and separates a radionuclide mixture into two groups for analysis. Separations are accomplished by passing the sample through anion exchange resins in the hydroxide-sulfide-carbonate form, allowing alkali metal ions and alkaline earth ions to pass through the column. Further separations from sodium are accomplished by precipitating potassium, rubidium, cesium, and the alkaline earths with sodium tetraphenyl boron. This results in three fractions, the anion exchange resins, the tetraphenyl boron precipitate, and the separated sodium. This procedure allows the determination of concentrations of 10-20 elements in a single sample. The method is being applied to precipitation studies of scavenging mechanisms in the atmosphere, environmental pollution, and elemental ecological transport.

14506 APTIC NO. 32495

Vadot, L.

ATMOSPHERIC POLLUTION, ITS ACTION AND STUDY IN THE LABORATORY BY MEANS OF HYDRAULIC MODELS. *(La pollution atmospherique, ses mecanismes et son etude en laboratoire au moyen de modeles hydrauliques). Text in French. Ingenieursblad, 40(13-14):394-403, 1971.*

The many difficulties encountered in applying mathematical formulas to the determination of appropriate stack heights are analyzed. In a classical atmosphere, temperature changes as a function of altitude. As a result of the weather, this is normally not the case at low altitudes as demonstrated by the fumigation, lofting, trapping, fanning, coning or looping of a smoke plume resulting from differences in the thermal structure of the atmosphere. Great industrial agglomerations present a particular climatology due to the existence of numerous constructions; coastal and mountainous locations likewise manifest climatological peculiarities. For these reasons, diffusion of pollutants can only rarely be satisfactorily determined by calculation only. The phenomenon can be studied to advantage on hydraulic models. Thus, the diffusion of combustion gas issuing from a stack into the atmosphere can be simulated by pouring salt water through an inverted stack model into a receptacle with pure water. Experimental arrangements for the study of the diffusion of pollutants simulating conditions in an adiabatic atmosphere, in a stratified atmosphere, and under other conditions are described. The model can also be used for the determination of a fallout pattern from an industrial enterprise, city, or entire region.

14507 APTIC NO. 31796

Wells, C. H. and R. W. J. Lau

STOCHASTIC MODELING AND CONTROL OF AMBIENT AIR QUALITY: A NEW APPROACH. *Preprint, Inst. of Electrical and Electronics Engineers, San Francisco, Calif. and Western Electronic Manufacturers Assoc., Los Angeles, Calif., 8p., 1971. 18 refs. (Presented at the Western Electronic Show and Convention, San Francisco, Calif., Aug. 24-27, 1971.)*

Existing air pollution simulation models have not been validated with actual ambient air pollution data. The two major reasons for the lack of correlation between simulated and actual data are that the physical systems is far more complex than the model, and available sensors are unreliable and inaccurate. A summary of existing deterministic air pollution models is presented, and their attributes and faults are discussed. A stochastic model is proposed in lieu of a deterministic model. The stochastic model is simple in structure and adaptive by nature, i.e., the parameters in the model are tracked by the data processing algorithm. A method to determine a priori parameter estimates is presented along with a method to track parameter changes and detect pollution violations statistically. Finally, a method to optimally control the air quality in the regional area is discussed. (Author abstract)

14508 APTIC NO. 32356

Wescott, J. W., W. R. Simmons, and C. G. Little

ACOUSTIC ECHO-SOUNDING MEASUREMENTS OF TEMPERATURE AND WIND FLUCTUATIONS. *Environmental Science Services Administration, Boulder, Colo., Wave Propagation Lab., ERLTM-WPL-5, 24p., Jan. 1970. 7 refs.*

NTIS: COM-71-00241

A Mark I echo sounder was constructed to observe the scatter of acoustic waves by thermal fluctuations and turbulent velocity motions in the boundary layer of the lower atmosphere. The theory of atmospheric scatter is reviewed. System design characteristics are presented for the basic acoustic echo sounding system and the Mark I sounder. Performance of the Mark I echo sounder, with results of the initial field experiment, is examined. The Mark I echo sounder was designed for a nominal range of 500 feet to match the height of the meteorological tower used as the site for testing. The observed signal-to-noise ratios were comparable to those predicted. With directional antennas, the noise level observed at 2 kHz was comparable to that predicted for 5 kHz and some 24 dB less than that predicted for 2 kHz. Bistatic echoes were apparently stronger and less variable than monostatic echoes. During very strong temperature inversions, ground clutter echoes were obtained, indicating the need to improve the side-lobe suppression by approximately 20 dB more. It should be possible to derive information on the spatial correlation distance of thermal plumes and, by cross-correlation techniques, to derive profiles of wind speed direction. Recommendations are presented for a further development program.

14509 APTIC NO. 32264

Westwater, Ed. R. and Otto Neall Strand

STATISTICAL INFORMATION CONTENT OF RADIATION MEASUREMENTS USED IN INDIRECT SENSING. *J. Atmospheric Sci., vol. 25:750-758, Sept. 1968. 15 refs.*

The information content of radiation measurements used in inferring profiles was defined as a reduction in uncertainty in the estimation of a profile after the measurements are introduced. The information depended directly on the kernel of the equation of radiative transfer, the covariance matrix of experimental error, and the covariance matrix of the a priori statistical information. Calculations based on the minimum rms inversion method were applied to the indirect probing of the vertical temperature distribution by microwave measurements of oxygen thermal emission. Choice of optimum location of measurements is discussed and the proposed method is compared to that of Twomey. The methods differed considerably in optimum ranking. (Author abstract modified)

14510 APTIC NO. 31926

Wilson, Carroll L.

POLLUTION AND THE WORLD FUEL CHOICES IN THE 21ST CENTURY. *Edison Elec. Inst. Bull., 39(4):179-184, July/Aug. 1971. (Presented at the Edison Electric Institute, Annual Convention, 39th, Cleveland, Ohio, June 9, 1971.)*

Although by the year 2000 global thermal power is expected to be six times the present level, it is not expected that it will affect the global climate. It is likely that the principal impact in terms of climate change will arise, if it does, from the combustion of hydrocarbons to which the only present alternative would be nuclear power. The effect of carbon dioxide and fine particulates upon the global heat balance is considered, and recommendations pertaining to CO2 emissions and oil discharges are given. Since the projected 18% increase resulting from fossil fuel combustion to the year 2000 might increase the surface temperature of the earth by 0.5 C, various studies are indicated to determine what actually will be the effects of CO2 and fine particulates upon the heat balance. (Author abstract modified)

14511 APTIC NO. 32304

Winghart, J.

THE ANALOG MODEL OF ATMOSPHERIC POLLUTION. *(Le modele analogique de pollution atmospherique). Moniteur (Belge), p. 1-13, June 16, 1970. 2 refs. Translated from French. Translation Consultants, Inc., Arlington, Va., 44p., 1970.*

The dispersion of atmospheric pollution in the region of Grenoble, France, has been observed in the natural environment and also with the aid of a model. In order to construct a model representative of the forms of flow characteristic of mountains and the dynamic development of air masses with differing temperatures, climatological data were collected and measurements made to increase the understanding of the lower layers. The first work carried out with the model consisted in setting up maps to plot the distribution of wind directions with altitude. Next, the development of cold air masses was studied. A clear understanding of the diffusion situation in Grenoble was gained with respect to protection against industrial pollutants.

14512 APTIC NO. 31831

Yen, K. T.

METEOROLOGICAL AIR POLLUTION MODELING. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 33p., 1971. 22 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City , N. J., June 27-July 2, 1971, Paper 71-92.)*

An approach to the development of a meteorological air pollution model and a scheme for pollution monitoring and forecasting for an urban region are presented. Two dynamic equations governing the transport and diffusion of the pollutants are derived: the mesoscale diffusion equation controlling the pollutant distribution in an urban area and the macroscale diffusion equation which can be used to find the transport of pollutants from one metropolitan area to another. To be consistent with the two averaging scales for the large-scale and mesoscale motions, the same scales should be used as the basic sampling or averaging scales for the pollutant concentrations. The two scales in time are of the order of several minutes and two hours. The characteristics of Gaussian models are examined. An example is given to show that only for mesoscale winds of a specific type can the Gaussian model be modified to include the effects of such winds in the vertical standard deviation of the concentration distribution. The proposed monitoring network has a surface station separation of a few kilometers, and is found to be compatible with the computational grid for mesoscale prediction. Such a network appears to have the necessary density for surveillance of pollutant emissions in the industrial area. In the scheme, a procedure for carrying out the prediction of large-scale winds, mesoscale winds, and pollutant distribution is given, and the required computing time estimated. (Author abstract modified)

14513 APTIC NO. 32500

Yokoyama, Nagayuki

SMOKE DIFFUSION BY WIND TUNNEL EXPERIMENT. *(Fudo jikken ni yoru baien kakusan). Text in Japanese. Preprint, Smaller Enterprises Promotion Corp. (Japan), 20p., 1971. 16 refs.*

General patterns and basic theoretical calculation formulas for smoke diffusion are examined. A theoretical approach to verify similarity between experimental conditions in a wind tunnel and actual topographic and meteorological conditions in the locality being modeled is presented. Similarity of flow and diffusion of smoke as indicated by the Reynolds, Froude, and Rossby numbers were important for the wind tunnel diffusion test. Topographical models for the test were reduced to a scale of 1/100 1/1000 and sometimes more in the vertical or horizontal scale, according to the local atmospheric conditions. The strength of turbulent flow generated in a wind tunnel was approximately equal for both vertical and horizontal directions, where as under actual atmospheric conditions it is greater for the horizontal than for the vertical direction. The tracer gas used in the wind tunnel test was ethylene or propane gas. A sample measuring system for use in a wind tunnel diffusion test is described.

14514 APTIC NO. 32409

Zuyev, V. Ye., M. V. Kabanov, and Yu. A. Pkhalagov

EXPERIMENTAL INVESTIGATION OF ATTENUATION OF INFRARED RADIATION IN THE TRANSPARENCY WINDOWS OF THE ATMOSPHERE IN THE 1-2.5 MICRON REGION. *Bull. Acad. Sci. USSR Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana), 4(7):447-448, July 1968. 4 refs.*

The source of light radiation was searchlights with reflector diameters of 350 and 600 mm and angles of divergence of 0.07 and 0.06 rad respectively, which were located at distances of 1.2, 3.5, and 9.86 km from the receiving station. The radiation sources were first compared with respect to the intensity and spectral composition of radiation; flux intensity during the measurements was monitored with respect to the feed current parameter. The method measuring the atmosphere's spectral transparency consisted of the sequential recording of radiation spectra of the sources for different paths and their subsequent comparison with the spectrum of the practically unattenuated radiation of the source. Transparency fluctuations due to turbulent mixing in the atmosphere did not lead to noticeable errors of the measurements. In the investigated spectral range of wavelengths, attenuation of optical radiation during snowfall had a neutral character. There was a strong spectral dependence of the depth of the transparency windows during haze. Meteorological elements (temperature, wind, and humidity) were also measured.

BASIC SCIENCE AND TECHNOLOGY

14515 APTIC NO. 32021

Southern Research Inst., Birmingham, Ala.

AN ELECTROSTATIC PRECIPITATOR SYSTEMS STUDY. (FINAL REPORT). *NAPCA Contract CPA 22-69-73, 65p., Oct. 30, 1970. 26 refs.*

NTIS: PB 198150

A summary of the results of an electrostatic precipitator systems study was presented. A literature review was first prepared covering the major sources likely to contain articles on precipitators or related subjects. A selection was then made of articles containing significant precipitator data. Precipitator fundamentals such a corona generation, particle charging, particle collection, removal, electrical energization, systems analysis, design, mechanical components, gas flow, resistivity, measurement of performance, trouble shooting and maintenance, and electrostatic augmentation and unusual designs were reviewed. The principal use of electrostatic precipitators in the control of industrial dusts in in the areas of electric power generation, pulp and paper, rock products, iron and steel, nonferrous metals, petroleum, chemical industry, and municipal incinerators. The extent of the use of precipitators, the range of input variables, and the design factors, costs, and problems peculiar to the use of precipitators in the particular industry were determined.

14516 APTIC NO. 32121

Abeles, F. B., L. E. Craker, L. E. Forrence, and G. R. Leather

FATE OF AIR POLLUTANTS: REMOVAL OF ETHYLENE, SULFUR DIOXIDE, AND NITROGEN DIOXIDE BY SOIL. *Science, 173(4000):914-916, Sept. 3, 1971. 9 refs.*

Data are presented in support of the idea that reaction with the soil, through microbial or chemical means, can remove ethylene, other hydrocarbons, sulfur dioxide, and nitrogen dioxide from the air. Soil samples (50 g for ethylene, 250 g for S02 and N02) were placed on petri plates in desiccators (2.5-liter capacity for ethylene, 10-liter capacity for S02 and N02) equipped with sleeves on their lids. Gases were introduced and removed through a rubber vaccine cap fitted on the side arm of the lid collar. The concentrations of ethylene and other hydrocarbons were measured by flame ionization gas chromatography on an alumina column. Sulfur dioxide was measured according to the method of Adams with the use of a fixed gas volume, and nitrogen dioxide was measured according to the evacuated bottle method of Saltzman. The fact that bacteria are known to consume hydrocarbons, including ethylene, and the fact that ethylene uptake by soil is heat-sensitive, requires oxygen, and occurs after a lag period suggests that microorganisms are the major sink for ethylene. The uptake of S02 and N02 was more rapid than that of ethylene. Their removal appeared to be due mainly to some chemical reaction.

14517 APTIC NO. 32380

Bary, Paul

REACTION BETWEEN SULFUR DIOXIDE AND HYDROGEN SULFIDE IN HYDROCARBONS. *(Reaction des anhydrides sulfureux et sulfhydrique dans les hydrocarbures). Text in French. Rev. Gen. Caoutchouc, 8(71):25-26, 1931. 6 refs.*

The reaction between SO2 dissolved in toluene and H2S dissolved in toluene and the resulting formation of sulfur was observed microscopically. The initially clear liquids mixed together assume a progressively deeper yellow coloring which after five to ten minutes turns orange. The particles causing the turbidity grow in size and after several hours form a sediment at the bottom of the vessel with a supernatant clear yellow liquid. Spread on a glass pane the liquid evaporates leaving a thin layer of a viscous liquid of oily consistency covered with drops of spherical shape. After one to ten days the thin oily layer crystallizes to bundles of long parallel prismatic needles. The drops in turn are covered by many opaque droplets which finally also begin to crystallize. Thus the resulting product of the interaction between SO2 and H2S in a solution of toluene is amorphous sulfur (deposited at the bottom) and crystalline sulfur from the supernatant liquid.

14518 APTIC NO. 31808

Batten, J. J. and G. R. Johnston

A PRELIMINARY STUDY OF THE REACTION BETWEEN NITROUS OXIDE AND NITROGEN DIOXIDE. *Intern. J. Chem. Kinet., 3(4):381-383, 1971. 13 refs.*

The reaction between nitrous oxide and nitrogen dioxide (N2O + NO2 yields nitrogen + oxygen + nitric oxide) was studied in a conventional static system at 773 K. Gaseous reaction products were analyzed at room temperature with a time-of-flight mass spectrometer. The second reaction (N2O + NO yields N2 + NO2) and the third reaction (M + N2O yields N2 + O + M) were also studied to estimate their contributions to the rate of the first reaction. The extent of N20 decomposition during the third reaction was 10% after 67 hr at 773 K. However, in the presence of equal quantities of NO and N2O in the second reaction, the extent of N2O reaction was about 55%. In the case of the first reaction, no significant change in the extent of N2O reaction was observed when the above nitric oxide was replaced by an equal amount of nitrogen dioxide. Thus the extent of the reaction of N2O in presence of NO or of an NO2/NO/O2 mixture are equal.

14519 APTIC NO. 31820

Benson, Sidney W.

SOME RECENT DEVELOPMENTS IN THE GAS-PHASE PYROLYSIS OF HYDROCARBONS. *Advan. Chem. Ser., no. 97:1-19, 1970. 71 refs.*

Recent work on the elementary steps of importance in hydrocarbon pyrolysis is described and summarized from a quantitative and predictive point of view. This includes the normal H atom metathesis reactions, addition of radicals to unsaturates, isomerization of radicals, fission reactions responsible for chain propagation, and the initiation and termination steps. The large negative activation energies characteristic of kinetic chain lengths put an upper limit of about 1000 K on the temperature at which propagation steps are important. Arrhenius parameters for molecular reactions of unsaturated hydrocarbons are discussed, in particular Cope rearrangements and 1,5 H shift reactions. Some anomalies from shock tube data are described briefly, as are the kinetic properties of small biradicals. Some difficulties of kinetic modeling are discussed along with the importance of deviations of unimolecular rate constants from Arrhenius behavior at high temperatures. (Author abstract)

14520 APTIC NO. 31758

Boyer, A., D. Cooper, W. Cote, and S. Shanks

A WORKING SYSTEM FOR THE MANAGEMENT OF EMISSION INVENTORY INFORMATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 26p., 1971. (Presented to the Air Pollution Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-10.)*

An advanced system for the handling of emission inventory information is described which includes routines for the abstracting of specific information about individual sources as well as the production of summaries which can be used in the day-to-day operations of various sections of the control agency. Provisions are also included for maintaining the data in a current state and modifying either specific sources or classes of sources for simulation purposes. The techniques used in collecting the data are described and examples of summaries and other reports prepared by the system are given. The inventory was carried out in metropolitan Toronto during 1969-70 and is expected to be expanded geographically throughout Ontario. The system operates on a large-scale general purpose computer and utilizes COBOL programming routines. An interesting aspect of the system is the successful interface between the FORTRAN model and the COBOL information system. (Author abstract modified)

14521 APTIC NO. 32430

Clark, L. W.

EDDY CURRENT CONTACT ABSORBERS FOR SULFUR DIOXIDE. *(Wirbelstrom-Kontaktabsorber fuer Schwefeldioxid). Text in German. Chem. Anlagen Verfahren, no. 7-8:46-47, July-Aug. 1968.*

An eddy current contact absorber was developed based on a previously used prototype scrubber that processes flue gas from a coal-fired boiler installation. The sulfur dioxide content of the gas at the scrubber inlet is 0.05 to 0.15% by volume. The effectiveness of the absorption depends on the difference between partial pressure of the gas to be dissolved and its vapor pressure above the absorbing liquid. The partial pressure of SO2 gases in concentrations of 0.05 to 0.15% is about one mm Hg. To maintain an active pressure differential, the vapor pressure above the liquid must, therefore, be near zero. The vapor pressure is a function of the temperature of the absorbing liquid and of the pH value. The pH can be influenced by the use of various alkaline solutions as absorbing liquids. The usual alkali for SO2 absorption are sodium carbonate and potassium carbonate. At minimum concentration, either of these solutions can maintain a pH value of 10 to 12, at which condition the vapor pressure of the SO2 is almost zero, as desired.

14522 APTIC NO. 32374

Dainton, F. S. and K. J. Ivin

THE PHOTOCHEMICAL FORMATION OF SULPHINIC ACIDS FROM SULPHUR DIOXIDE AND HYDROCARBONS. *Trans. Faraday Soc., vol. 46:374-381, 1950. 6 refs.*

The reaction between sulfur dioxide and hydrocarbons which occurs in the gas phase in the presence of ultraviolet light was studied. In all cases the quantum yield was less than unity. The reaction afforded a new method for the preparation of aliphatic sulfinic acids. It proceeded most readily with long chain paraffins. The tertiary carbon atoms were attacked more readily than the secondary, and the secondary more readily than the primary. Olefins, which retarded the reaction of paraffins, were less reactive than paraffins due to their high quenching ability with respect to excited SO2 molecules. (Author abstract modified)

14523 APTIC NO. 31971

Feugier, A.

IONIZATION IN FLAMES. *(L ionisation dans les flammes). Text in French. Rev. Gen. Thermique (Paris), 9(105:1045-1064, Sept. 1970. 50 refs. (Presented at the Societe Francaise des Thermiciens, Paris, France. (Jan. 21. 1970.)*

Great progress has been achieved in the interpretation of the phenomenon of ionization in flames, ever since it became clear that ions in hydrocarbon flames were not of thermal but of chemical origin. The velocity of the ions can be determined from the migration of charged particles in an electric field created by two electrodes inserted into the flame. The ionic yield is expressed by the number of ions created by a molecule of the combustible transformed. In a methane-oxygen-nitrogen flame, approximately one molecule in a million produces one ion. Ionic yield is a function of temperature and equals the ratio between ion formation velocity and fuel combustion velocity. Ionic yield also varies with the nature of the hydrocarbon. It increases with the number of carbon atoms in the molecule. The structure of the molecule also plays a role thus, butane and isobutane have a different ionic yield). The most abundant ion in hydrocarbon flames is H30+, other ions are CH50+, CH30+, CH0+. A certain number of negative ions like OH-, 0-, CH3-, 02- and were detected by mass spectrometry. Some compounds like hydrogen, carbon monoxide, formic acid, and formaldehyde do not produce ions. Ionization in flames seeded with alkaline elements and with alkaline earth elements is reviewed. Gas chromatography uses ion detection to analyze hydrocarbons. Electric properties of flames can be used for controlling inflammable gas mixtures. Another application of flame ionization is the determination of the interference between internal combustion engines and an electromagnetic signal.

14524 APTIC NO. 32444

Fukuda, Kazuo, Kiyoyuki Kawai, Nobuaki Miyata, and Tadao Totani

A BOX FOR INHALATION EXPERIMENT, A MICROSCOPIC ENVIRONMENT IN A CAGE TO BREED ANIMALS. *(Kyunyu jikkenbako, dobutsu shiiku keigi nai bisho kankyo). Text in Japanese. Rodo Eisei Kenkyusho Nenpo (Ann. Rept. Natl. Inst. Ind. Health), 1971:37-38, July 1971.*

In order to improve experiments on chronic inhalation, conditions of temperature, humidity, carbon dioxide, ammonia, dust, and bacillus were measured in the environments of an inhalation room, an inhalation box, and a cage. Five rats were kept in three types of standard cages: a polycarbonate cage, a wire netting cage with panels, and a completely netted cage. The relation between standard frequency of ventilation and the temperature and humidity was determined for the inhalation box, and the amounts of C02 and NH3 were measured. In the polycarbonate cage, the temperature and humidity increased more and the activities of the animals were more influential than in the environment of the breeding room, where air was at standard conditions. In the wire netting cage, ventilation was good and there was a tendency to reflect air-conditioned breeding conditions. Ventilation was an important factor in the environment of the inhalation box.

14525 APTIC NO. 32238

Fuller, C. E.

DEVELOPMENT TESTING AND APPLICATION OF A THREE-DIMENSIONAL LASER DOPPLER VELOCIMETER FOR THE MEASUREMENT OF GAS FLOWS. *Hayes International Corp., Birmingham, Ala., NASA Contracts NAS8-21527 and NAS8-21162, Rept. 1678, 101p., April 1970. 11 refs.*

NTIS: N71-14048

The development and application is described of a three-dimensional laser Doppler velocimeter system for the measurement of local mean and fluctuating gas velocities with high spatial and temporal resolution. This sytem uses optical instrumentation to remotely gather laser light which has been directed into jet or wind tunnel flows. Optical heterodyning is used to detect the Doppler frequency shift in the laser light which occurs when the light is scattered by small tracer particles within the flow. This Doppler frequency shift is mathematically related to the velocity of the particle, the wavelength of the laser light, the angular arrangements of the incident and scatter light, and the angle between the incident light and the velocity vector. Tracer particle size and concentration measurements were also investigated.

14526 APTIC NO. 32118

Hanson, Ronald K.

SHOCK-TUBE STUDY OF VIBRATIONAL RELAXATION IN CARBON MONOXIDE USING PRESSURE MEASUREMENTS. *AIAA (Am. Inst. Aeron. Astronaut.), J., 9(9):1811-1818, Sept. 1971. 13 refs.*

Measurements of pressure on the end wall of a shock tube were used to infer the continuously varying rate of vibrational excitation behind incident shock waves in undiluted carbon monoxide. Results are presented in the form of separate relaxation-time plots for each shock wave studied. The data cover the temperature range 2400-6000 K an

14527 APTIC NO. 32145

Lasseur, Claude

THE PRINCIPAL MECHANICAL AND ELECTRICAL PROPERTIES OF AEROSOLS. APPLICATIONS TO PROTECTION FROM RADIATION. *(Les principales proprietes mecaniques et electriques des aerosols. Applications a la radioprotection). Text in French. Commis. Energ. At. (Fr.), Serv. Doc., Ser. Bibliogr., no. 185, 49p., Oct. 1970. 69 refs.*

Mechanical properties of aerosols of natural and of man-made origin including fallout in a calm and agitated atmosphere are reviewed. The effect of Brownian movement is manifested by agitation velocity, molecular diffusion and median quadratic displacement, molecular coagulation, turbulent coagulation, and combined coagulation and decantation. Electrical properties of aerosols included the motion of charged particles in a homogeneous field (the Langevin theory of ionic mobility, theory of mobility derived from the Stokes law, and comparison of the two theories), the acquisition of charges by aerosol particles (mechanisms of particle charges, charging of particles by bombardment, charging of particles by diffusion), and the effect of polarization. The application of the mechanical and electrical properties of aerosols to protection against radiation are reviewed (retention of dust in respiratory passages, study of natural radioactive aerosols, sampling devices for radioactive aerosols (fiber filters, impactors and electrostatic precipitators)). While mechanical and electrical properties do not completely characterize aerosols because there are other properties like the vapor tension of a particle, the Brownian rotation movement, thermal properties, condensation and photoelectric properties the diameter of a particle, its settling velocity, its displacement by diffusion, electric mobility, and electric velocity constitute the principal elements in the study, measurement, and application of aerosols.

14528 APTIC NO. 31980

Lenoir, Jean-Yves, Philippe Renault, and Henri Renon

GAS CHROMATOGRAPHIC DETERMINATION OF HENRY S CONSTANTS OF 12 GASES IN 19 SOLVENTS. *J. Chem. Eng. Data, 16(3):340-342, 1971. 17 refs.*

Henry s constants, as determined by gas-liquid chromatography, are reported for gaseous solutes in 16 polar solvents and three heavy hydrocarbons. The gaseous solutes are methane, ethane, propane, butane, isobutane, ethylene propylene, 1,3-butadiene, propylene, carbon dioxide, hydrogen sulfide, and sulfur dioxide. The relative deviation among the values does not exceed 6.5%, and the average relative deviation is three percent. In the present work, the solubility of air was obtained at atmospheric pressure in a cell by measuring of the volume of air absorbed in degassed solvent. From the measurement of air solubility, the reduced retention volume of air was easily deduced, and the dead volume of the chromatographic system obtained with great precision.

14529 APTIC NO. 32386

Lichtenstein, Meyer and James J. Gallagher

INVESTIGATION OF MOLECULAR CONSTITUENTS IN THE ATMOSPHERE. (FINAL REPORT). *Martin Marietta Corp., Orlando, Fla., Air Force Contract F19628-68-C-0146, Proj. 8603, Task 860303, Work Unit 86030301, Rept. AFCRL-71-0006, Martin Marietta OR-11,015, DOD Element 61102F, DOD subelement 681310, 62p., Dec. 20, 1970. 11 refs.*

NTIS, DDC: AD 721187

Millimeter spectroscopic studies were performed on the ozone molecule in the frequency range from 10 GHz to 500 GHz. Sixty-six rotational transitions previously unobserved in ozone were located in the region 50 GHz to 316 GHz and accurate frequency measurements were performed on each transition. In addition to these measurements, Stark and Zeeman studies studies were performed for linewidth measurements. Six transitions in sulfur dioxide were observed and frequency measurement taken in the region from 280 GHz to 286 GHz; two new deuterium transitions were observed. Stark effect studies were performed in the water and hydrogen sulfide molecules, providing data for the re-evaluation of the dipole moments for these molecules. A search for transitions arising from excited energy levels in water and hydrogen cyanide molecules was undertaken. (Author abstract modified)

14530 APTIC NO. 32225

MacKay, Colin, Mary Pandow, and Richard Wolfgang

ON THE CHEMISTRY OF NATURAL RADIOCARBON. *J. Geophys. Res., 68(13):3929-3931, July 1, 1963. 6 refs.*

Detailed studies with carbon-11 atoms of high kinetic energy confirmed that natural radiocarbon initally reacts in the atmosphere to form carbon monoxide. The incorporation of a small fraction of the hot C-11 as carbon dioxide was also established. The normal reaction of C atoms with oxygen apparently results almost exclusively as CO. The involvement of nitrogen can provide a third body, making the production of CO2 possible. The C-14 content of atmospheric CO was studied. Carbon dioxide was first removed from air by chilling it close to the liquefaction temperature and passing it through a silica gel adsorption trap. Both the 0.1 ppm of CO2 which escaped this procedure and the atmospheric methane were eliminated by liquefaction of the O followed by fractional distillation through 20 distillation trays of downcoming liquid N. Carbon monoxide was then removed from the N waste stream by oxidation over cuprous oxide and adsorption in a chilled liquid N trap. The resulting CO2 was then desorbed and precipitated as barium carbonate in barium hydroxide. Several samples of atmospheric CO showed a specific activity much higher than would be expected from the predominantly fossil fuel origin of this gas.

14531 APTIC NO. 31774

Megaw, W. J. and A. C. Wells

PRODUCTION OF MONODISPERSE SUBMICRON AEROSOLS OF WHICH EACH PARTICLE CARRIES A SPECIFIED NUMBER OF ELECTRONIC CHARGES. *Nature, vol. 224:689-690, Nov. 15, 1969. 5 refs.*

Experimental studies of aerosols can be simplified by producing them with particles which are, within narrow limits, of the same size. The most convenient particles are often Dow polystyrene spheres available as suspensions in liquid with particle diameters ranging from 0.1 to 1.0 micrometer; and aerosols are produced by diluting, spraying, and drying. Exposure of the aerosol to a concentration of small ions, for example from a radioactive source, can overcome image effects due to the very high electrical charges a proportion of the particles may contain. Thus, the particles acquire a steady charge distribution, and their electrical energy follows, to a good approximation, a Boltzmann distribution. Such an aerosol will contain uncharged particles and progressively smaller numbers carrying one, two, three, and more electronic charges, depending on the particle diameter. A mobility spectrometer can use this effect to produce a monodisperse aerosol containing particles which are all uncharged or which carry a specified number of positive or negative charges.

14532 APTIC NO. 32123

Paul, R. C., C. L. Arora, and K. C. Malhotra

NATURE OF THE COMPLEXES OF SULPHUR TRIOXIDE WITH INORGANIC BASES. *Indian J. Chem., vol. 9:473-476, May 1971. 25 refs.*

Sulfur trioxide forms one to one complexes with selenium and tellurium tetrachlorides and phosphorus pentachloride to form monochlorosulfates which are ionic compounds and polymerized to a little extent. Infrared, conductance, and cryoscopic data in protic and aprotic solvents suggest them to be ionic in nature. Also, S03 forms one to one adducts with triphenylchloromethane, tetrabutylammonium chloride, triotrithiazyl chloride and fluoride, which are ionic in nature; there is no indication of any polymerization. It forms two compounds of composition ICl2 (S03Cl) and I(S03Cl)3 with iodine trichloride. Iodine dichloride monochlorosulfate is a strong base of chlorosulfuric acid whereas iodine trichlorosulfate is a weak acid of the system. (Author abstract)

14533 APTIC NO. 32146

Peskin, Richard L.

SOME EFFECTS OF PARTICLE-PARTICLE AND PARTICLE-FLUID INTERACTION IN TWO PHASE FLOW SYSTEMS. *Princeton Univ., N. J., Dept. of Mechanical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1969, 121p. 41 refs.*

The intensity of motion and the diffusivity of a single particle suspended in a turbulent fluid is discussed. The statistical behavior of particle motion is considered for the case of an isolated particle and for the case in which other similar particles present in the fluid exert pressure forces on the particle. The relationship between the motion of particles in a turbulent fluid and Brownian motion is considered, and general expressions for velocity correlation and mean square displacement which are valid for both transient and steady-state situations are obtained. These relations are used to obtain the intensity and diffusivity for Brownian motion and for motion in which the correlation of driving forces is exponential. The pressure forces which are present when more than one particle is in motion in a fluid is approximated as an inverse fourth power spacial force. This approximation is used with the method of characteristics to obtain expressions for the probability distribution of the random pressure interaction force exerted on a given particle. A stationary approximation to this correlation is used to evaluate the intensity and diffusivity of a single particle due to random pressure forces. Conditional probability distributions and the assumption of correlation in a turbulent fluid are used to show that the diffusivity of an isolated particle in a turbulent fluid is less than the eddy diffusivity of turbulence. A specific expression for the probability of turbulent velocities encountered by an isolated particle is used to obtain its diffusivity as a function of particle radius, density, and Reynolds number. The diffusivity is of the same order of magnitude as those obtained experimentally. When the diffusivity for the isolated particle is combined with the interaction diffusivity, the results show that the slower and larger particles are affected by the particle-particle interaction, while the faster particles behave essentially as if there were no other particles present. (Author abstract modified)

14534 APTIC NO. 32407

Peskin, Richard L.

BASIC STUDIES IN GAS-SOLID SUSPENSION. (QUARTERLY REPORT). *Rutgers -- The State Univ., New Brunswick, N. J., Coll. of Engineering, Atomic Energy Commission Contract AT(30-1)2930, Rept. 65-2, 14p., June 11, 1965. 8 refs.*

The basic fluid mechanics and heat transfer processes associated with gas-solid suspensions in turbulent flow were investigated. Fine structure properties such as the nature of gas-solid suspension turbulence were also studied. Heat transfer and cooling experiments, mass transfer experiments, gas dynamic studies, and theoretical studies on particle motion and turbulence generation were conducted. Supersonic gas particle flows, pressure pulsation, Brownian motion, and solids density profile studies are also discussed.

14535 APTIC NO. 31854

Peters, Max S.

CATALYTIC MECHANISMS FOR NITROGEN OXIDES REDUCTION. (FINAL REPORT). *Colorado Univ., Boulder, Engineering Research Center, Research Grant ORG/NAPCA AP 00388, 15p., March 1, 1971.*

The theoretical understanding of catalytic mechanisms involved in nitrogen oxides reduction reactions were extended and the catalytic activity based on electronic chemical potential was studied. Experimental studies were conducted on the reduction of nitrous oxide and nitric oxide with carbon monoxide using various types of inorganic and organic semiconductors as catalysts for the reduction reactions. The catalytic properties of a large number of materials were determined with particular emphasis placed on pyrolyzed polyacrylonitrile, nickel oxide, and chromium-promoted iron oxide. Mechanisms for the catalytic reduction reactions were examined and kinetic rate data were obtained. The electronic chemical potential of both organic and inorganic semiconductors for catalytic activity was examined experimentally. Work was concentrated primarily on the role of pyrolyzed polyacrylonitrile as an organic semiconducting catalyst with studies made on conductivity characteristics and catalytic activity based on various pyrolysis conditions. The long-term aim to theoretically and experimentally examine the mechanism of catalytic activity on the basis of solid-state characteristics of semiconductors was partially achieved. The specific mechanism and kinetic data obtained could be applied for consideration of a catalytic-type muffler for ridding automobile exhaust of nitric oxide.

14536 APTIC NO. 31907

Politzer, Ieva Ruks, Gary W. Griffin, and John L. Laseter

SINGLET OXYGEN AND BIOLOGICAL SYSTEMS. *Chem. Biol. Interactions (Amsterdam), 3(2):73-93, April 1971. 94 refs.*

Singlet oxygen is receiving increasing attention as a reactive species in many chemical and biological systems. It can be generated easily by microwave discharge, chemically, or by photosensitized irradiation, and is a common reactive pollutant atmospheric generated by solar radiation. Singlet oxygen reacts by photooxidation with a host of materials unaffected by normal oxygen. From a biological standpoint, there is strong evidence that living systems have mechanisms for the protection of molecules such as lipids and nucleic acids which would otherwise be damaged by exogenous singlet oxygen. Other constituents such as chlorophyll and riboflavin in living systems are, in turn, excellent singlet oxygen sensitizers. Further, there are indications that living systems may produce singlet oxygen internally, for example in the enzyme peroxidase-catalase system. The presence of singlet oxygen in biological systems has led to new theories on carcinogenesis. Examples from current chemical literature are presented which illustrate the scope of singlet oxygen reactions and/or serve as models for biochemical processes. (Author summary modified)

14537 APTIC NO. 32212

Raabe, O. G. and G. J. Newton

DEVELOPMENT OF TECHNIQUES FOR GENERATING MONODISPERSE AEROSOLS WITH THE FULWYLER DROPLET GENERATOR. (ANNUAL REPORT). *Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., Fission Product Inhalation Program, AEC Contract AT(29-2)-1013, p. 13-17, Nov. 1970. 9 refs. NTIS: LF-43*

Since aerosol particle size can have a significant influence on deposition, clearance, and the pattern of radioactive irradiation on various organs, the Fulwyler Droplet Generator was developed to produce uniform droplets. A high frequency signal is converted to mechanical vibrations by a piezoelectric crystal coupled to a small, pressurized liquid reservoir. A liquid stream, emitted from the reservoir through a small orifice (approximately 15 micron) is uniformly disrupted by the ultrasonic vibrations into very uniform droplets of about 20 to 30 micron in diameter. Up to 300,000 droplets per second can be generated with less than one percent variation in droplet volume. Monodisperse insoluble particles can be made from droplets containing organic complexes of a chosen metal after heat treatment of the aerosol. The advantages of this method include greater uniformity of size than obtained by other methods, absence of satellites, and reproducible and accurate electronic control with no moving parts. But the technical problems under study include dispersion and drying of the droplets without coalescence or disintegration, maintenance of dependable operation for long periods, and use of minimum air for dispersion to produce aerosols of high concentration.

14538 APTIC NO. 32162

Rodkey, F. Lee and Harold A. Collison

AN ARTIFACT IN THE ANALYSIS OF OXYGENATED BLOOD FOR ITS LOW CARBON MONOXIDE CONTENT. *Clin. Chem., 16(11):896-899, 1970. 27 refs.*

The carbon monoxide content of reduced and completely oxygenated blood was analyzed by gas chromatography. Oxygenated blood always released more CO (approximately 0.01 vol% greater) than reduced samples, when neutral ferricyanide was used as an oxidant. The response from oxygenated blood was identical with that from reduced blood when acid potassium ferricyanide was used. Neutral K3Fe(CN)6 or acid potassium iodate significantly increased the CO response from oxygenated blood. Neutral potassium manganate and acid potassium chromate caused CO formation in amounts many times the amount of carboxyhemoglobin present. When CO is released in citric acid with K3Fe(CN)6 at a pH of about 3.5, the CO released from oxygenated blood is only about 0.001 vol% greater than that released from reduced samples. These differences indicate the formation of small amounts of CO during reactions used to release CO from blood. Reduced hemoglobin and carboxyhemoglobin appear to be much more stable to these procedures than oxyhemoglobin. (Author abstract modified)

14539 APTIC NO. 32491

Romankov, P. G.

DEVELOPMENT TRENDS OF CHEMICAL ENGINEERING. *(Tendentsii razvitiya khimicheskoy tekhniki). Text in Russian. Vestn. Akad. Nauk SSSR, 40(4):22-30, 1971. 9 refs.*

The development trends in chemical engineering in the U.S.S.R. are discussed. The enlarged scale of chemical industry, crude oil processing, and related industries brought about the need to build apparatuses of higher production capacity and, at the same time, to build machines for mechanical, hydromechanical, heat-and mass-exchange processes of much larger dimensions. One of the main trends of modern chemical industry is intensification of individual technological processes, e.g., increased rate of flow of gases and liquids in absorption and rectification columns, which requires new constructional designs. Application of new technology (for example, low-temperature plasma) in chemical production calls for development of new equipment. The development of new continuous vacuum driers for paste-like materials will help with the recovery of volatile solvents. A nitric acid production plant is mentioned which uses catalytic disintegration of nitrogen oxides to prevent air pollution. Production tends to be organized in closed cycles to minimize waste.

14540 APTIC NO. 32087

Singh, T. and R. F. Sawyer

REVIEW OF RATE DATA FOR CO/H2/02 SYSTEM REACTIONS. *California Univ., Berkeley, Thermal Systems Div., National Air Pollution Control Administration Res. Grant AP-385-05, Rept. TS-70-3, 30p., July 1970. 53 refs.*

The kinetic rate data for some reactions of importance in the combustion of hydrocarbon systems are reviewed. The available rate data for each reaction were plotted as a function of inverse of temperature. A straight line based on a least squares fit was passed through the available rate data and the suggested values of Arrhenius parameters were determined. The reactions studied included the rate of consumption of oxygen molecules in low pressure premixed flat flames of CH4, C2H4, C2H6, and oxygen; the reaction of OH radicals with hydrogen; the initial attack on methane in CH4/02 combustion; the recombination of hydrogen atoms; the decomposition of 02 in shock wave; the combustion of fuel rich methane flames, and thermonuclear recombination reactions. (Author abstract modified)

14541 APTIC NO. 32236

Singh, T. and R. F. Sawyer

KINETIC MODEL FOR THE AFTERFLAME ZONE OF PREMIXED ETHANE/OXYGEN AND ETHYLENE/OXYGEN FLAMES. *Preprint, Combustion Inst., Pittsburgh Pa., Eastern States Section, 24p., 1970. 22 refs. (Presented at the Combustion Institute Eastern States Section Meeting, Atlanta, Ga., Nov. 5-6, 1970, Paper TS-70-4.)*

The reactions in the afterflame zone of ethylene/oxygen and ethane/oxygen flames at equivalence ratios of 0.67, 0.80, and 1.00, pressures of 0.083 and 0.054 atm, and in the temperature range of 1500 to 1700 K, supported on a water-cooled rectangular flat flame burner were investigated. Temperature and composition profiles for carbon monoxide, carbon dioxide, oxygen, nitrogen, water, argon, and hydroxide were measured. Theoretical flame structures were calculated by numerical integration of the coupled kinetic rate equations and the diffusion equations. Measured temperature profiles were employed obviating the need for including the energy conservation relations. A consistent disagreement was obtained between the observed and calculated profiles of CO, CO2, OH, H2O, and O2. A systematic variation in the value of rate coefficients for various reactions and initial estimates for the radical species (H and O) concentrations leads to a good qualitative agreement between the theoretical and experimentally observed mole fraction profiles.

14542 APTIC NO. 32012

Stanley, William J.

SIMULATION TECHNIQUES FOR AIR POLLUTION CONTROL PROGRAM DEVELOPMENT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1971. 16 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1972, Paper 71-122.)*

Computer simulation techniques now being used in four areas of control program design personnel training, control program evaluation, cost effectiveness, and trade-off relating to water and land pollution problems are descirbed. Gaming simulation techniques for solving environmental problems include Inter Nation Simulation, Temper, the Northeast Corridor Game, Metropolis, APEX, the Community Land Use Game, and City I. The users of operational simulation models are able to generate a large number of alternative futures in a short period as the result of the time- collapsing feature of these models. Other advantages are the exposure to an interdisciplinary tool, which requires a comprehensive approach to issues and problems because no factors are held constant; the minimal expense of operation; and the illustration of the interrelationships that exist in complex systems.

14543 APTIC NO. 31763

Tammet, H. F.

THE ASPIRATION METHOD FO? THE DETERMINATION OF ATMOSPHERIC-ION SPECTRA. *(Aspiratsionnyi metod izmereniya spektra aeroionov). Tartu Riikliku Ulikooli Toim., no. 195, 1967. 405 refs. Translated from*

Russian by A. Honigbaum, Israel Program for Scientific Translations (Jerusalem), 200p., 1970.

NTIS: TT-68-50499

An air ion spectrum measuring method in which the precipitation of air ions in the measuring capacitor is electrometrically recorded is examined. The general theory of the aspiration method under ideal conditions is reviewed. The requirements imposed on the measuring capacitor are rendered more stringent, possibilities of measuring integral quantities with the aid of differential counters are indicated, and new variants of the method of modulating the air-ion current in the measuring capacitor are suggested. Deviations from the ideal conditions are then examined. The systematic measurement errors are investigated and the range of application of the aspiration method determined. Empirical relationships are developed which suffice for the quantitative estimation of the essentially nonlinear edge effect. The distorting effects caused by an increase in the air-ion concentration, the asymmetry of the measuring capacitor, and the mass of air ions are calculated. A theory is developed for the resolving power of the counter which is limited by diffusion and turbulence. The adsorption of air ions at the counter inlet are considered. The parameters and design principles of aspiration counters are then examined. A quantitative estimation of the counter sensitivity is carried out in order to specify the requirements for the stability of the voltage supply. The spectrum measurements under conditions of fluctuating air-ion concentrations are discussed on the basis of special observation results. Allowance is made for design calculations and the optimization of the counter parameters. A survey of the different designs of the aspiration counter and a description of the SAI-TGU-66 universal aspiration counter are included. (Author abstract modified)

14544 APTIC NO. 32494

Tarroni, G.

THE USE AND CHARACTERISTICS OF A MONODISPERSE REVOLVING DISC AEROSOL GENERATOR. *(Emploi et caracteristiques d un generateur d aerosol s monodisperses a disque tournant). Text in French. J. Aerosol Sci., 2(2):257-260, 1971. 4 refs.*

The construction of a monodisperse aerosol generator working on the revolving disc principle yields particles of a diameter smaller than one micron. A compressed air motor propelling the disc at velocities up to 390,000 rev/min generates particles down to a diameter of 0.1 micron. The diameter of the disc is 1.6 cm, its weight 3.3 g. The aerosol formed by the impact of solution drops against the disc is diluted by a stream of air supplied by a special air duct with a terminal in the form of a cone which surrounds the liquid supply tube. Besides diluting the aerosol, part of the air stream also removes small droplets (which are 15 times as numerous as the principal drops). The aerosol generator processes between 0.5 and one cu cm liquid/min. A test solution of polystyrene in xylene yielded spherical particles whose diameters varied from 0.1 to two micron for different dilutions and disc velocities from 233,000 to 390,000 rev/min). The monodispersion of the aerosol is independent of particle dimension. The aerosol concentration as it leaves the generator is 10,000 particles/cu cm with an output of 10 l/min resulting from 0.5 cu cm liquid/min.

14545 APTIC NO. 31818

Whitby, Kenneth T. and A. R. McFarland

THE DECAY OF UNIPOLAR SMALL IONS AND HOMOGENEOUS AEROSOLS IN CLOSED SPACE AND FLOW SYSTEMS. *Franklin Inst. Research Labs., Philadelphia, Pa., Proc. Intern. Conf. Ionization Air, Philadelphia, Pa. 1961, p. VII-1-30. 13 refs. (Oct. 16-17.)*

The decay of ion concentration in a jet and around a point source was investigated. Solutions to these two problems and some experimental data were presented. Solutions and experimental data for the charging and subsequent decay of aerosol concentration due to strong point and uniform ion sources were also presented. The decay of small ions in a closed space in the absence of a source is very rapid, and the rate is independent of the size and geometry of the space. The concentration of ions contained in a free jet of air issuing from a generator drops off as the square of the distance from the jet origin. For not greater than 10 to the 6th power, the ion concentration in an enclosed space, free jet or in a steady flow system such as an air conditioning duct, is independent of the initial concentration, and a function only of time since the ion left the source. Thus it is impossible to pipe small ions without serious loss, the losses being a function only of the time that the ions remain in the pipe. The concentration of ions around a point source decreases one and a half times and the electric field decreases half as much as the power of the radius. Neutral aerosol particles in the presence of a point source of unipolar ions are charged rapidly and are then precipitated on the boundaries of the space by the electric field surrounding the source. Equations were derived relating particle size and source strength. The equilibrium particle charge is reached rapidly, is quite uniform, and may be as high as 10% of the equilibrium surface in the presence of a strong source.

14546 APTIC NO. 32271

Wright, R. H. and R. E. Burgess

SPECIFIC PHYSICOCHEMICAL MECHANISMS OF OLFACTORY STIMULATION. *Ciba Foundation, London (England), Taste Smell Vertebrates, Ciba Found. Symp., 1969, p. 325-342. 29 refs.*

The course of an odorous molecule as it moves into contact with the receptor organ was traced. The possible ways in which its vibrational character might enable it to exercise a selective stimulation and thereby impress its own specificity upon the organism in examined. The transport and electrical dipole of the molecule, molecular vibration, interacting dipoles, limiting osmic frequencies, and thermodynamic considerations are discussed. The vibrational properties of a molecule are capable of imparting the requisite degree of specificity to several kinds of interaction, and the upper and lower limits to the scale of osmic frequencies prescribed by the theory coincided with the experimental limits. A permanent or induced dipole may help to orient the stimulus molecule with respect to the polarized membrane of the receptor nerve, and the vibrational modulation of the moment could govern the transfer of energy between stimulus and receptor. The differential stimulation of selectively sensitive receptors then enables the stimulus to impress its individuality upon the organism, and the essentially physical nature of the interaction makes possible the high sensitivity of the olfactory sense. (Author summary modified)

14547 APTIC NO. 32175

Zebel, Guenter

ON THE GROWTH AND RATE OF GROWTH OF AEROSOLS OF WATER-SOLUBLE SUBSTANCES AS A FUNCTION OF THE RELATIVE HUMIDITY IN AIR. *Z. Aerosol-Forsch. Therap., 5(4):263-288, Sept. 1956. 14 refs. Translated from German by Reilly Translations, Los Angeles, Calif., 24p.*

If a solution is sprayed in a room, then small droplets of the solution are found at high relative air moisture (humidity) while at low moisture, solid particles of the dissolved substance are suspended in the air as a residue of the drops of evaporated solution. These solid particles are again converted into small droplets of solution as the moisture increases. An aerosol of such a solution exhibits a frequency distribution of the droplet radii which varies with the relative humidity. The retention of the aerosol in the human lung depends primarily on the particle size. The penetration of a harmful aerosol into the alveoli can be prevented if the aerosol particles in the respiratory tract can attain a certain size rapidly enough. Through the addition of a salt aerosol to a fine, harmful dust, it can be rendered less dangerous for human breathing through rapid growth.

EFFECTS-HUMAN HEALTH

14548 APTIC NO. 32207

Dept. of Health and Social Security (London) England

CHRONIC BRONCHITIS. *In: On the State of the Public Health: The Annual Report of the Chief Medical Officer of the Department of Health and Social Security for the Year 1968, p. 222-226, 1968. 2 refs.*

The incidence and mortality from bronchitis in England was discussed. Mortality data show that there are differences according to geography, sex, social class, and occupation. The greatest number of deaths was found among coal miners, moulders, furnacemen, and laborers. The same features were also displayed by the morbidity data. When a large-scale study was made in 1961-1962 into the causes of incapacity for work in England, it was found that more work days were lost from bronchitis than any other cause. For every 1000 men of working age, bronchitis and emphysema were responsible for 1235 days incapacity compared with 723 days from influenza and 567 days from arthritis and rheumatism. Three factors are repeatedly incriminated as causes of chronic bronchitis: air pollution, occupational exposure to dust, and cigarette smoking. When towns are compared, mortality is shown to correlate directly with indices of pollution and with levels of domestic fuel consumption.

14549 APTIC NO. 32152

Antonelli, Giuseppe

EFFECTS OF THE PRESENCE OF FLUORINE IN AREAS IN THE VICINITY OF PLANTS WHERE IT IS PRODUCED, AND ITS TOXICITY WHEN USED FOR PROPHYLAXIS AND MEDICAL TREATMENT. *(Effetti del fluoro nelle regioni prossime ad industrie di sua produzione e tossicita di esso anche negli usi profilattici a terapeutici). Text in Italian. Rass. Trimestrale di Odontoiatria, 35(2):95-123, April-June, 1954. 7 refs.*

With a view to investigating the effects of fluorine exposure on the development of caries in teeth, a study was made of a hydrofluoric acid plant which uses a reaction between fluorspar and sulfuric acid. The tests conducted consisted of measuring the fluorine content and pH of watercourses in the area, toxic action on plant and animal life, effect on caries formation with plant employees and area school children, and occupational illnesses traceable to fluorine. Suggestions are given for the treatment and prophylaxis of fluorine poisoning and the proper pharmacological use of fluorine products, especially in the topical application of sodium fluoride as a means of preventing dental caries. The normal fluorine content of the teeth is 0.6%, as compared with 0.1% for the bones. The normal topical application of sodium fluoride, which consists of two cc of a two percent solution of the salt, can be considered to have negligible toxicologic effects, since even the entire maximum dosage per treatment of 40 mg NaF, assuming it were not diluted by saliva and mouth rinsings, would be insufficient to cause damage to the tissues.

14550 APTIC NO. 32217

Baader, E. W.

CLINICAL ASPECTS OF OCCUPATIONAL LEAD POISONING. *(L Aspect clinique de l intoxication saturnine professionelle). Text in French. Maroc Med. (Morocco), vol. 37:409-415, 1958.*

Experience gained from the examination of more than 4000 cases of lead poisoning is reviewed. Occupational lead poisoning is always chronic. The absorption of lead by the digestive tract always plays only an accessory role; percutaneous absorption plays a role only in the case of tetraethyl lead. The toxic effect of lead on the erythropoietic system is manifested by a reduction of hemoglobin and the number of erythrocytes, the appearance of basophile granulations in erythrocytes of protoplasmic origin, and a sometimes massive elimination of porphyrins in urine. Other symptoms include gingival coloration, colic accompanied by constipation, lack of appetite, fatigue, epigastric pressure, coronary spasms (angina), arthralgia, paralysis, encephalopathy, reduced sexual potency, loss of weight, impairment of intellectual faculties, and rarely an icterus. A blood level of lead in excess of 60 gamma is a reliable indicator of lead poisoning if the lead does not originate from the glass or syringe used in the test. Urine lead content cannot be counted on as an indicator because accumulated in the organism is often not released into the urine until after the greatest intoxication.

14551 APTIC NO. 32396

Berke, Harry L.

THE METABOLISM OF RARE EARTHS FOLLOWING INHALATION: PATHOLOGIC AND BIOCHEMICAL RESPONSE IN THE LUNG AND OTHER ORGANS. *Atomic Energy Commission Contract AT-(11-1)-1630, TR-COO-1630-11, 10p., March 15, 1969. 1 ref.*

Female rats were subjected to exposures of various aerosols for a three hour period and sacrificed at three and 24 hours, and at spaced intervals thereafter for about 70 days. Tissues and organs including bone were assayed. The whole skeleton was also dissected out and assayed as a check on previous calculations of skeletal burdens from femoral activity for europium. Excreta were collected separately for assay, and whole body counts for a number of animals were also obtained in vivo during the post exposure period.

14552 APTIC NO. 32404

Berke, Harry L.

THE METABOLISM OF RARE EARTHS FOLLOWING INHALATION: PATHOLOGIC AND BIOCHEMICAL RESPONSE IN THE LUNG AND OTHER ORGANS. (SUMMARY REPORT). *Wayne State Univ., Detroit, Mich., School of Medicine. Atomic Energy Commission Contract AT(11-1)-1630, Rept. COO-1630-10, 11p., March 15, 1969. 4 refs.*

The research accomplishments on the metabolism of rare earths following inhalation was summarized. The principal objectives of the study were the physical characterization of aerosols generated from solutions of selected rare earths and Group 3B elements; the deposition and retention of inhaled particulates as related to aerosol particle size; the development of sensitive tests for tissue response to irradiation from external and/or internal sources for use in the diagnostic determination of effects at low levels of exposure; the biological response of the lung and other organs to retained material in terms of developing pathology and tumorigenesis, organ function, and possible life span shortening; and synergism or potentiation of the biological effects of the stable isotope by concurrent radionuclide inhalation. An inhalation apparatus was designed and built with well-controlled pressure gradients, provisions for animal housing, aerosol sampling, and washing facilities. An improved aerosolizer was designed, built, and used for the inhalation studies. Its advantages include aerosolization from very small volumes of liquids where hazardous or expensive radioisotopes are to be used, simple conversion to use for large volumes of solutions, and consistency of aerosol concentration by the adjustment of the temperature of the aerosolizing jet. Generally, data indicated the high affinity of the rare earths for osseous tissue and its long term retention in bone.

14553 *APTIC NO. 31899*

Biener, K.

LEAD POLLUTION BY AUTOMOBILE EXHAUSTS. (Bleigefaehrdung durch Autoabgase). Text in German. Schweiz. Med. Wochenschr., 101(28):1038-1039, July 1971.

Seventy-nine refuse collectors and 79 street cleaners in Frankfurt/Main were examined for blood lead levels and delta-aminolevulinic acid elimination with urine. The subjects worked primarily in the center of the city, and most had been employed for five years. Blood samples were taken at 8:30 am about three hours after the beginning of work. Measured lead levels were significantly higher than those of the average level of a control group. The lead content of blood was higher among the street cleaners than among the garbage collectors. The same results were obtained for delta-aminolevulinic acid elimination. Even though clinical manifestations have not yet appeared, a biological lead contamination can be diagnosed among the workers.

14554 APTIC NO. 32366

Bloch, Winston W., Jr., Sylvester Lassiter, Jerry E. Stara, and Trent R. Lewis

BLOOD RHEOLOGY OF DOGS CHRONICALLY EXPOSED TO AIR POLLUTANTS. *Preprint, Air Pollution Control Office, Cincinnati, Ohio, Biological Research Branch, 16p., 1971. 17 refs.*

The viscosities in whole blood and plasma from dogs chronically exposed to laboratory produced air pollutants were studied. Ninety-one five-year-old female beagle dogs were separated into seven approximately equal groups and exposed to air pollutants for 16 hours daily for four years. The control group of 18 dogs was exposed to filtered, temperature and humidity-conditioned, clean air. Six ml blood samples were drawn on a random schedule. No average blood or plasma viscosity for any exposure group showed a statistically significant difference from the respective blood or plasma viscosity of the control group. Significant elevations of carboxyhemoglobin were seen in four treatment groups. Treatment groups having high carboxxyhemoglobin levels were those exposed to raw auto exhaust, irradiated auto exhaust, raw auto exhaust plus sulfur oxides, and irradiated auto exhaust plus sulfur oxides. Other air pollutant treatments include sulfur oxides and nitric oxide plus nitrogen dioxide.

14555 APTIC NO. 32267

Boissour, Hubert, Fernand Caujolle, R. Castagnol, and R. Gout

SENSIBILITY OF THE TESTICLE TO THE BORACIC ACID DURING ITS HISTOPHYSIOLOGICAL EVOLUTION. *Bull. Acad. Nat. Med. (Paris), vol. 149:137-144, Feb. 23, 1965. 12 refs. Translated from French. Sanzare Assoc., Inc., Philadelphia, Pa., 9p.*

The specific toxic impact of boric acid on the testicle of the rat was studied. Boric acid poisoning was induced in the stage before puberty (the first to seventh week), the puberty crisis, which occurs for the rat on the seventh week and lasts eight to ten days, and in the adult stage, i.e., puberty stage. During the period prior to the spermatogenesis, the testicle was not sensitive to boric acid poisoning. The poison was at its maximum efficiency during the puberty crisis: the boric acid attacked the stub cell in full division activity. After puberty, the various seeding ducts reacted with some sensitivity. Acute poisoning in this stage acted more sporadically than chronic poisoning, which affected a greater number of spermatogenesis.

14556 APTIC NO. 32041

Bolanowska, Wanda, Jerzy Piotrowski, and Barbara Trojanowska

THE KINETICS OF DISTRIBUTION AND EXCRETION OF LEAD (PB-210) IN RATS. I. THE DISTRIBUTION OF A SINGLE INTRAVENOUS DOSIS. *(Kinetyka rozmieszczania i wydalania olowiu (Pb-210) u szczurow. I. Rozmieszczanie wewnatrzustrojowe jednorazowej dawki dozylnej). Text in Polish. Med. Pracy (Lodz), 18(1):29-41, 1967. 11 refs. (Presented at the International Congress on Occupational Health, 14th, Madrid, Spain, 1963 and the Krajowym Kongresie Biochemii, Lodz, Poland, 1963.)*

A single dose of lead acetate (labeled Pb-210) was injected intravenously into adult albino male rats 200-250 g in weight. The animals were killed from 5 minutes to 98 days after injection. The organs were mineralized and the lead content was determined after one month, based on the Bi-210 beta irradiation, measured in an infinitely thick layer. Detailed data on the surviving periods, number of animals used, and on the distribution of lead (in percent of dosage) are included. The dynamics of lead distribution and characteristic periods of distribution are discussed. The data were analyzed with respect to the possible metabolic model and the rate of distribution processes. The different doses (1.0 and 0.1 mg/kg) compared for the surviving period of 30 days showed no significant differences in distribution.

14557 APTIC NO. 31816

Bouissou, H. and R. Castagnol

ACTION OF BORIC ACID ON THE TESTICLE OF THE RAT. *(Action de l acide borique sur le testicule du rat). Arch. Maladies Profess. Med. Trav. Securite Sociale (Paris), 26(6):293-306, June 1965. 12 refs. Translated from French. Translation Consultants, Inc., Arlington, Va., 24p.*

Examinations of testicular lesions in their developmental and final stages were conducted. Both puberal rats and rats that had not yet reached puberty were poisoned with boric acid. Boric acid had, in the case of the puberal male rat, an inhibiting and transitory effect on the spermatogenic function and occasionally caused destruction of the seminal ducts. Lesions appeared 30 days after the beginning of the experiment, and became more intense when the poisoning was repeated. Boric acid had its greatest effect at the time of maturation when the seminiferous cells are at their most sensitive stage. One dose alone, acting for a limited time, gave a variegated appearance with histological examination owing to the sporadic attack of some tubules at the same state of maturity, whereas all others experienced no damage. The accumulation of boric acid in the organism, as a result of repeated injections, caused the product to act in a more long-lasting manner and affected a greater number of seminiferous tubes which increased in vulnerability as they approached the adult stage. In the majority of cases where the attacks were intermittent, the various seminiferous tubules appeared to reform their ducting system after a period of 100 days. Supplementary experiments on impuberal rats and results obtained are described. The general conclusions indicated that boric acid administered in a single large dose does little damage to the testicle. Effects on the gonad are inequal and have not yet been the cause of definitive sterility. The testicle reacted with a special sensitivity to each one of the three physiological periods: the prepuberal phase, the puberal crisis phase, and the adult testicle phase. In the first phase the testicle was hardly sensitive and the spermatogonium remained quiescent. The inhibition by the poison was at its maximum during the puberal crisis; the boric acid can go to the extent of killing the cell during full-scale mitotic activity. After puberty, the various seminiferous tubules showed an intermittent sensitivity to the toxic action. The acute poisoning acted more sporadically than the chronic intoxication which affected a greater number of spermatogonia. (Author summary modified)

14558 APTIC NO. 31863

Buraczewski, O. and H. Rudzinska

THE SOCIAL IMPORTANCE OF PULMONARY CARCINOMA AS COMPARED WITH TUBERCULOSIS. *Pol. Med. J. (English Translation from Polish of: Gruzlica Choroby Pluc), 9(5):1149-1158, 1970. 6 refs.*

NTIS: TT 70-55007/5

The history of tuberculosis and pulmonary carcinoma is traced back to the industrial revolution. The rise in incidences of both diseases is associated with the industrialization and urbanization of communities. Until World War II, tuberculosis was the most important social disease. The control of tuberculosis was the main cause of the considerable extension of the average human life span. In connection with the prolonged life span, pulmonary diseases characteristic of old age appeared which depend on the working conditions and the environment. In countries where tuberculosis is no longer a social problem, it has been replaced by bronchial carcinoma. Statistical data on deaths from cancer of the lungs, bronchi, and trachea and pulmonary tuberculosis are included to illustrate the social importance of the problem. Countries with a high death rate due to bronchogenic carcinoma showed low indices of deaths from tuberculosis. The death rate for both is much lower in women than in men. In certain highly industrialized countries, the death rate due to bronchogenic carcinoma increased rapidly. Mortality rates for all neoplasms, malignant neoplasms, tuberculosis (all forms), and pulmonary tuberculosis are tabulated for Poland. The rise in mortality from malignant neoplasms of the respiratory tract is associated with a fall in the death rate from tuberculosis. The association of these deaths with industrialization, urbanization, and developing traffic is demonstrated by their distribution in the rural and urban populations.

14559 APTIC NO. 32015

Busey, William M., Alexis A. Krumm, and J. Wesley Clayton, Jr.

THE EFFECTS OF THE CHRONIC INHALATION EXPOSURE OF PRIMATES TO SULFUR DIOXIDE, PARTICULATES, AND THEIR MIXTURES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 43p., 1971. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-29.)*

To determine the effects of sulfur dioxide, calcium sulfate, and a mixture of the two on cynomolgus monkeys, three groups were exposed to 0.5 and 10 ppm SO_2, 10 mg/cu m $CaSO_4$, and one group to the combination of 10 ppm SO_2 and 10 mg/cu m $CaSO_4$. A control group was exposed to filtered room air. Measurements of body weights, the mechanical properties of the respiratory system (including compliance, pulmonary flow resistance, breathing, ventilation, oxygen diffusion, arterial blood gases), and hemotological and serum biochemical determinations were conducted periodically. At the end of the 24-month exposure period, all surviving animals were sacrificed and necropsied. The trachea, lungs, peribronchial lymph nodes, heart, aorta, liver, and kidneys were examined microscopically. Measurements of body weight, growth, and survival revealed no harmful effects of the exposures. No effects were seen in pulmonary function tests, and no morphological changes were seen in any of the organs examined. This study indicates that the role of SO_2 in various air pollution episodes is not completely understood. (Author abstract modified)

14560 APTIC NO. 32437

Camner, Per, Klas Philipson, Lars Friberg, Bo Holma, Borje Larsson, and John Svedberg

HUMAN TRACHEOBRONCHIAL CLEARANCE STUDIES. WITH FLUOROCARBON RESIN PARTICLES TAGGED WITH 18F. *Arch. Environ. Health, 22(4):444-449, April 1971. 9 refs.*

Human tracheobronchial clearance was studied with a test aerosol of monodisperse particles (approximately seven micron in diameter) of fluorinated ethylene propylene (Teflon 120) tagged with radioactive fluorine (18F), a positron emitter with a half-life of 110 minutes. Two women and six men were exposed twice to the test aerosol. The clearance differed appreciably between the individuals but the two determinations in the same individual were highly similar. The test aerosol employed should be suitable for intraindividual studies of tracheobronchial clearance in man and consequently of value for investigating the acute effect of different substances on tracheobronchial clearance. (Author abstract)

14561 APTIC NO. 32368

Caujolle, Fernand, Francois Fauran, Dang Quoc Quan, Anne-Marie Bonnell, and Rene Truhaut

TOXICOLOGY.--METABOLISM OF ARYLBORONIC ACIDS IN THE RAT. *(Toxicologie.--Metabolisme des acides arylboroniques chez le rat). C. R. Acad. Sci. Paris, Ser. D, Scientific Translation Service, Santa Barbara, Calif., 7p.*

Arylboronic acids were administered to rats, and their urine was examined for organoboric metabolites. The metabolism of the 12 arylboronic acids studied proceeds with the direct rupture of the boron-carbon bond. This rupture is considerable for all the derivatives, except for the m and p-carboxyl derivatives for which the stability is quite large. The organic copula is oxidized in the course of hydrolytic cleavage and regularly results in the corresponding phenol. In any case, the methyl group can become oxidized, which results in the corresponding phenolic acid.

14562 APTIC NO. 32038

Chanh, Pham Huu, A. M. Pene, and M. C. Gelade

THE COMPARATIVE TOXICITY OF PENTAERYTHRITOL DIPARACHLOROPHENYLBORATE IN THE MOUSE AND RAT. *(Toxicite comparee du diparachlorophenylborate de pentaerythritol a l egard de la souris et du rat). Rev. Agressologie, 6(1):57-60, 1965. 5 refs. Translated from French. Leo Kanner Assoc., Redwood City, Calif., 5p., April 1971.*

Experiments were carried out with rats and mice to study the toxicity of pentaerythritol diparachlorophenylborate as a prelude to its use as a drug for such disorders as epilepsy. It was suspended in neutralized olive oil, 10-20 g/100 ml, and administered in a single dose either intraperitoneally or orally by gastric tube. Each day the percentage mortality and mean lethal dose were determined. No apparent signs of toxicity were observed in animals treated with infralethal doses of pentaerythritol diparachlorophenylborate. Even in lethal doses as large as the LD-50, the effects developed slowly. Animals which survived the toxic action of the compound awoke abruptly after a long coma. Those animals which were about to die showed an irregular, panting respiration. Hiccups occurred before death.

14563 APTIC NO. 32487

Chisolm, J. Julian, Jr.

LEAD POISONING. *Sci. Am., 224(2):15-23, Feb. 1971*

In the young children of urban slums, lead poisoning is a major source of brain damage, mental deficiency, and serious behavior problems. Large-scale screening programs now in progress in Chicago and New York City indicate that between five and 10% of the children tested show evidence of asymptomatic increased lead absorption and that between one and two percent have unsuspected plumbism. At the level of cellular metabolism, the best-known adverse effect of lead is its inhibition of the activity of enzymes that are dependent on the presence of free sulfhydryl groups for their activity. The clearest manifestation of the inhibitory effect of lead on the activity of sulfhydryl-dependent enzymes is the disturbance it causes in the biosynthesis of heme. Lead is implicated specifically in the metabolism of delta-aminolevulinic acid and in the final formation of heme from iron and protoporphyrin. The decrease in heme synthesis leads at first to a decrease in the life-span of red cells and later to a decrease in the number of red cells and in the amount of hemoglobin per cell. The presence of stippled cells is the most characteristic finding in the blood of a patient with lead poisoning. In acute lead poisoning, there are visible changes in the kidney and kidney function is impaired. Much of the excess lead is concentrated in the form of dense inclusions in the nuclei of certain cells, including those lining the proximal renal tubules. Fanconi s syndrome is described. The best known chronic effect of lead poisoning is chronic nephritis, a disease characterized by a scarring and shrinking of kidney tissue. Peripheral nerve disease also can result from chronic overexposure to lead.

14564 APTIC NO. 32079

Cholewa, Loen, Wieslaw Jedrychowski, Marian Sosin, and Julian Zabicki

CHRONIC NONSPECIFIC RESPIRATORY DISEASES IN CRACOW. XIII. A PILOT FIELD STUDY IN AN INDUSTRIAL ESTABLISHMENT. *Epidemiol. Rev. (English translation from Polish of: Przeglad Epidemiol.), 24(2):135-139, 1970. 7 refs*

NTIS: TT 70-55001/2

An epidemiologic study was conducted to investigate the relations between the prevalence of nonspecific respiratory diseases, especially chronic bronchitis, and working environment and occupation. Pilot studies, in conjunction with periodic health checks, were carried out in the steel mill and railway transport departments of the Lenin Metallurgical Establishment in Krakow. The analysis covered respiratory symptoms, past diseases, smoking habits, and occupational health hazards. Cough and phlegm production were more frequent in the steel mill workers. Effort dyspnea was rare in the transport workers and more frequent in the steel mill. In both groups, smoking and chronic bronchitis were correlated, especially in the steel mill. Comparison of past diseases showed that chronic bronchitis was more frequent in the steel mill workers. Pneumonia occurred more often in the transport workers, but diseases of the nose were more frequent in the mill workers. In the transport department, 60% of the persons were employed under conditions harmful to health; in the steel mill the number was 93.5%. Transport workers were exposed only to atmospheric factors during work, and very little to the various occupational hazards of work in the steel mill.

14565 APTIC NO. 32408

Cramer, Kim

HEAVY METALS AND OUR ENVIRONMENT -- ALSO ON TV. *(Tunga metaller i var omgivning -- och i TV). Text in Swedish. Lakartidningen, 65(8):799-801, Feb. 1968. 2 refs.*

Several professionals were interviewed during the preparation of a Swedish TV documentary entitled Is it Dangerous to Breathe Lead? Weaknesses in the telecast are discussed, the most serious of which was an exaggeration of the danger from lead poisoning to the inhabitant of a large city who is not directly engaged in an occupation involving exposure to lead. The show s approach to lead poisoning was influenced by experiences with the lead industry in England in the early 20th century, when little was being accomplished in the field of occupational medicine. Workers for a storage battery company in Manchester breathed air containing three to five mg of lead. Under such conditions, lead poisoning was not only severe, but the lead tended to accumulate in the worker s body. It is not necessarily valid to compare these conditions with the problems due to lead intake from the polluted air of a large city, which reaches a maximum of 0.003 mg/cu m, or about 1/60 of the lead concentration to which the lead industry workers were exposed.

14566 APTIC NO. 32144

Deane, Margaret, John R. Goldsmith, and Dorothy Tuma

RESPIRATORY CONDITIONS IN OUTSIDE WORKERS. *Arch. Environ. Health, vol. 10:323-331, Feb. 1965. 10 refs. (Presented at the Air Pollution Medical Research Conference, Annual, 7th, Los Angeles, Calif., Feb. 10-11, 1964.)*

Two groups of men, one from Los Angeles, the other from San Francisco, were examined with respect to participation, age, occupation, smoking, and interviewer performance to assess the possible effect of these factors on San Francisco-Los Angeles comparisons. Respiratory symptoms were found to occur more frequently among present cigarette smokers than among the non-cigarette smoking participants. In the Los Angeles group, the frequency of respiratory symptoms increased with age. A loss-to-study factor was suggested to explain the decrease in respiratory symptoms with age in the San Francisco group. The prevalence of cough and phlegm appeared to be primarily related to cigarette smoking, while shortness of breath, episodes of increased cough and phlegm, and abnormal pulmonary function test values depend more upon age-related factors than upon smoking. Consistent trends were seen demonstrating the decrease of pulmonary function with age, smoking, and the presence of respiratory symptoms. Carbon monoxide concentratons in expired air was notably lower among individuals who never smoked. Regression analysis of pulmonary function values yielded results similar to those reported in other studies.

14567 APTIC NO. 32418

Dolgova, M. A.

EXPERIMENTAL-MORPHOLOGICAL STUDY OF LYMPHATIC NODES UNDER EFFECT OF SOME TOXIC SUBSTANCES IN RABBIT. *(Eksperimental nomorfologicheskoye issledovaniye limfaticheskikh uzlov krolika pri vozdeystvii nekotorykh toksicheskikh veshchestv). Text in Russian. Arkh. Anatom. Gistol. i Embriol., 55(9):3-11, 1968. 9 refs.*

Oil solutions of perfluoroacetone and trichloroprene, administered perorally to rabbits in acute, subacute, and chronic doses, produced changes in mesenteric, inguinal, and axillary lymph nodes. Acute intoxication caused dilation and swelling of cells in the nodal sinuses, enlargement of lymphoid follicles, and hyperplasia of reticular cells. These changes persisted with chronic administration of perfluoroacetone, whereas prolonged trichloroprene poisoning led to hyperplasia of lymphoid tissue. Acute poisoning caused an increase in cell nucleoprotein content, but chronic trichloroprene intoxication reduced nucleoprotein content. Chronic levels of perfluoroacetone produced no noticeable effect. It was also shown that vascular wall permeability is greater with aqueous than with oil solutions of these toxins.

14568 APTIC NO. 32438

Dowell, Anthony R., Kaye H. Kilburn, and Philip C. Pratt

SHORT-TERM EXPOSURE TO NITROGEN DIOXIDE. *Arch. Internal Med., 128(1):74-80, July 1971. 23 refs. (Presented at the Hanford Biology Symposium on Pollution and Lung Biochemistry, Annual, 10th, Richland, Wash., June 5, 1970.)*

Eleven beagles were exposed to nitrogen dioxide in concentrations ranging from 3 to 16 ppm for one hour. Two control dogs were air-ventilated for one hour. Widespread bleb formation, loss of pinocytotic vesicles, and mitochondrial swelling of endothelial cells ensued. Intra-alveolar edema occurred in most dogs exposed to 7 ppm NO2 or higher and membrane damage without edema occurred in the others. Intra-alveolar edema observed by light microscopy was associated with impaired surfactant activity and lung compliance. Exposure to NO2 of 5 ppm or greater resulted in decrease of recovered lung lavage saturated lecithin. Exposure to 3 ppm NO2 resulted in bleb formation in alveolar endothelium without biochemical or physiological changes. (Author abstract)

14569 APTIC NO. 31736

Eybl, V., J. Sykora, and F. Mertl

INFLUENCE OF SODIUM SELENITE, SODIUM TELLURITE AND SODIUM SULFITE ON RETENTION AND DISTRIBUTION OF CADMIUM IN MICE. *Arch. Toxikol., vol. 26:169-175, 1970. 16 refs. Translated from Ger-*

man. Mundus Systems, McGregor, and Werner, Washington, D. C., 9p.

The influence of sodium selenite on the retention and distribution of cadmium in the organism was compared with the action of chemically analagous compounds: sodium tellurite and sodium sulfite. Tests were carried out with male mice, and cadmium retention was determined by a scintillation spectrometer. Sodium selenite caused a prolonged retention of cadmium in the organism, while sodium tellurite and sodium sulfite had no effect on cadmium retention. The effect of sodium selenite was long lasting.

14570 APTIC NO. 31732

Fink, Hermann, Ilse Schlie, and Klaus Schwarz

ABOUT THE NUTRIENT CAUSED LIVER NECROSIS AND THE SELENIUM CONTENT OF POWDERED MILK OF DIFFERENT ORIGIN. *Z. Naturforsch., vol. 22: 1144-1449, 1967. 24 refs. Translated from German. Sanzare Assoc., Inc., Philadelphia, Pa., 14p.*

Powdered skim milk from different sources was studied in tests with rats for its ability to trigger liver necrosis and its content of selenium. Selenium contents of 0.2 microgram/gr of dry substance prevent the development of this deficiency disease; with selenium contents of 0.1 microgram or less/gr of powdered milk, a high percentage of test animals died regularly of liver necrosis. Samples from Nuremberg showed a considerably lower selenium content than the samples from Cologne. Variations during the drum drying process did not have any influence on the onset of liver necrosis and the selenium content of the powder. However, a considerable loss of selenium was noted during the process of pre-evaporation.

14571 APTIC NO. 32186

Friberg, Lars

THE MEDICAL BACKGROUND FOR THE RECOMMENDATIONS. *In: Recommendations Relating to Norms for Sulfur Dioxide Content in Open Air. (Rekommendationer rorande riktvarden for svaveldioxidhalt i utomhusluft). Swedish Government Air Pollution Board, Stockholm, Communication 6601, 1965 (?). Translated from Swedish by Scientific Translation Service, Inc., Santa Barbara, Calif., p. 3-9, 1967.*

Studies show a correlation between the occurrence of diseases of the respiratory tract and the degree of air pollution. Pollutants exert their effect on the respiratory passages either directly on the mucous membrane or indirectly by way of various nervous centers or various physiological functions such as breathing frequency or breathing resistance. Damaging gaseous pollutants are sulfur oxides, nitrogen oxides, oxidizing agents, and aldehydes. The data on the effects of sulfur dioxide that can serve as a basis for recommending a medical norm derive from both experimental and epidemiological studies. Experimental studies relate to such fundamental questions as the mechanisms and relative toxicity of various substances. Epidemiological studies show that in the London disaster of 1952, a marked increase in mortality was observed after several days of a daily average sulfur dioxide level content of 75 ppm with local 48-hour values as high as 134 ppm. A two-hour SO2 value not to exceed 25 ppm and a 30-day value not to exceed 5 ppm is recommended.

14572 APTIC NO. 31983

Fusamura, Nobuo

EFFECTS OF DUST AND AIRBORNE DUST SURVEY. *(Funjin no eikyo to funjin sokuteiho). Text in Japanese. Imono (Foundry), 43(7):24-33 July 1971. 11 refs.*

Foundry dust contains various types of aerosols which can cause pneumoconiosis (silicosis and asbestos lung), sometimes accompanied by tuberculosis of the lungs. American and Soviet dust tolerances are reviewed. The tolerance for dust containing more than 30% isolated silicic acid is 2 mg/cu m; for dust with less than 30% silicic acid, the tolerance is 5 mg/cu m. The concentrations are only for the eight-hour working day, not taking into account overtime hours. Public ordinance 304 limits dust concentrations within buildings to 0.15 mg/cu m. Methods for measuring dust and types of dust collectors are described. Respirable dust of less than 5-7 micron must be measured, since this is the dust that penetrates into lungs. Standard equipment of foundries in England, personal air sampler systems, and individual sampler systems are compared for England, the United States, and Japan. Mechanized and automatic measuring systems, which directly indicate the degree of concentration, and measurement methods of dust concentration in the exhaust gas of smoke ducts (as required by the Air Pollution Control Law) are described.

14573 APTIC NO. 32397

Guibert, L.

THE PRACTICAL IMPORTANCE OF THE CONCEPT OF DETERMINANT IN ALLERGOLOGICAL PRACTICE. *(Importance en pratique allergologique de la notion de determinant). Text in French. Le Poumon Coeur (Paris), 24(3):285-293, 1968. 4 refs.*

The specificity of antibodies is due to the existence of antibody sites which have a structure complementary to the homologous sites or determinants on the antigenic molecule. In an extract of house dust, nine fractions may be separated by chromatography with a column of diethylamino ethyl cellulose. Four of these were active. Patients are ofen selectively sensitive to one of these fractions. This explains the variable responses to desensitivization treatment with the complete extract. The existence of cross reactions is due to common determinants in various antigens. This explains the favorable results in desensitivization with substances which have no apparent relationship to the causative substance but which cause similar syndromes and local reactions. Thus there is one determinant which is specific for Botrytis, at least two determinants which are common to Botrytis, dust, feathers, and Epicoccum, at least two determinants which are common to Botrytis, dust, and feathers, and at least three determinants common to Botrytis and dust.

14574 APTIC NO. 32206

Henry, Mary C., Richard Ehrlich, and William H. Blair

EFFECT OF NITROGEN DIOXIDE ON RESISTANCE OF SQUIRREL MONKEYS TO KLEBSIELLA PNEUMONIAE INFECTION. *Arch. Environ. Health, vol. 18:580-587, April 1969. 9 refs. (Presented at the American Medical Association, Air Pollution Medical Research Conference, Denver, Colo., July 23, 1968.)*

A study was undertaken to define the effects in squirrel monkeys of 10 to 50 ppm nitrogen dioxide, Klebsiella pneumoniae infection, and the combination of the two stresses. At inhaled doses of 10,000 organisms of K. pneumoniae, no effect was noted on the respiratory function; when monkeys received a dose of approximately 100,000 organisms, they showed a reduced tidal volume about five days post challenge, which returned to normal with seven to 14 days. Single two-hour exposures to 10, 15, 35, and 50 ppm of N02 affected the pulmonary function in squirrel monkeys. At the lower concentrations, 10 and 15 ppm, the tidal volume decreased with little or no change in respiratory rate. The pulmonary function returned to pre-exposure levels within 24 to 48 hours. Exposure to 35 and 50 ppm N02 had a marked effect on respiratory function with a sharp decrease in tidal volume and a marked increase in respiratory rate which persisted for 48 to 72 hours. Histopathologic changes were noted in lung tissue of all monkeys exposed to N02. The primary lesion was an effect on the alveoli of the lung characterized by varying degrees of expansion. At concentrations of 15 ppm and above, changes in liver and kidney tissue were noted. Although single acute exposures to N02 in concentrations of 50 ppm or below did not produce deaths, a combined stress of 50 ppm N02 and K. pneumoniae produced mortality. At concentrations of 35 ppm or less, mortality did not occur, but clearance of the bacteria from lungs was delayed or prevented. Some LDH isoenzymes were also affected by the N02 exposure.

14575 APTIC NO. 31734

Henschler, D. and U. Kirchner

ON THE ABSORPTION AND TOXICITY OF SELENIUM SULFIDE. *Arch. Toxikol., vol. 24:341-344, 1969. 10 refs. Translated from German. Sanzare Assoc., Inc., Philadelphia, Pa., 8p.*

Reports were considered which treat insoluble sulfide of selenium as equally toxic and easily absorbed from the gastrointestinal tract as soluble selenium compounds. The sulfide actually had a very low toxicity; the mean lethal dose in mice was 3.7 g/kg. The symptomatology is also proved to be quite different from that of sodium selenite intoxication. Repeated oral administration of five, 25, or 125 mg/kg/day of selenium sulfide or seven and a half weeks was tolerated without signs of intoxication. (Author summary modified)

14576 APTIC NO. 32502

Hettche, H. O.

AIR POLLUTION AND LUNG CANCER. *(Luftverunreinigung und Lungenkrebs). Text in German. Naturwissenschaften (Berlin), 58(8):409-413, Aug. 1971. 8 refs.*

To clarify the relationship between air pollution and lung cancer, 14,500 deaths due to this disease, occurring over the period 1960-1968, were collated by age, sex, place of birth, and occupation. The highest mortality, 50 per 10,000 for the age groups over 55, was recorded for males from urban areas of the Ruhr Valley, the lowest in the rural population. Related to occupation, the mortality was four for indoor workers, 10 for industrial occupations, and 18 for outdoor urban workers. Female urban deaths were 10% of male deaths. (Author summary)

14577 APTIC NO. 32434

Huber, Gary L., Robert J. Mason, Marc LaForce, Nancy J. Spencer, Donald E. Gardner, and David L. Coffin

ALTERATIONS IN THE LUNG FOLLOWING THE ADMINISTRATION OF OZONE. *Arch. Internal Med., 128(1):81-87, July 1971. 40 refs. (Presented at the Hanford Biology Symposium on Pollution and Lung Biochemistry, Annual, 10th, Richland, Wash., June 5, 1970.)*

Inhalation of ozone (five ppm for three hours) by rabbits resulted in morphologic alterations in the pulmonary alveolar macrophages recovered from the lungs of exposed animals. These structural alterations were characteristic of cellular injury or cell death and included intracellular vacuolization, dilatation of the endoplasmic reticulum and perinuclear envelope, swelling of mitochondria, cell lysis, and formation of myelin figures and autophagic vacuoles. Exposure to ozone had no significant effect on pulmonary surface activity, phosphatide composition, or fatty acid composition of phospholipids recovered from extracts of the whole lung or by bronchioalveolar lavage from exposed animals. A dose-related functional impairment in alveolar macrophage intrapulmonary anti-bacterial defense mechanisms resulted from exposure to lower levels of ozone. Similar dose-related impairments in macrophage function were induced with prolonged oxygen administration. (Author abstract)

14578 APTIC NO. 32080

Jedrychowski, Wieslaw

CHRONIC NONSPECIFIC RESPIRATORY DISEASES IN CRACOW. XIV. THE RELATION OF WORKING ABSENTEEISM FROM RESPIRATORY DISEASES TO SOME ENVIRONMENTAL CONDITIONS. *Epidemiol. Rev. (English translation from Polish of: Przeglad Epidemiol.), 24(2):140-144, 1970. 3 refs.*

NTIS: TT 70/55001/2

Sickness absenteeism due to nonspecific respiratory diseases in four groups of physical workers employed at posts in Krakow exposed in varying degrees to dust pollution of air and velocity of air movement was analyzed. The highest percentage of workers taking advantage of sickness absenteeism was in the category III and IV posts. In these same groups, the average number of days of absenteeism per worker were higher. The mean number of days of absenteeism per worker on medical sick leave were similar in all groups. The percentage of long sick leaves was higher in workers of the older age groups. 0Categories III and IV had a much higher percentage of sensitive persons, consisting of workers who were absent from work for respiratory diseases for more than 16 days. The working posts of the categories III and IV differed from those of categories I and II with respect to velocity of air movement, and working conditions in category III and IV posts were worse.

14579 APTIC NO. 32218

Jung, Fritz

THE PATHOLOGY OF ERYTHROCYTES. PART II. THE EFFECTS OF SOME METAL SALTS. *(Zur Pathologie der roten Blutkoerperchen. II. Mitteilung. Wirkungen einiger Metallsalze). Text in German. Arch. Exp. Pathol. Pharmakol., vol. 204:139-156, 1947. 14 refs. Part I. Klin. Worchshr., p. 917, 1942.*

The effects of zinc sulfate, and lead nitrate on isolated human erythrocytes was studied by means of an ultramicroscope and a potentiometer. High concentrations of mercury chloride caused fixation of erythrocytes and of erythrocytal stromata without significant optical structural changes. At lower HgCl2 concentrations, all degrees from the outside to the inward progressing fixation of cellular proteins were observed ultramicroscopically. Very low concentrations precipitated hemoglobin inside the cell with a simultaneous increase of osmotic resistance. Increasing concentrations brought about progressive hemolysis based on membranal denaturation. This was followed by a coagulation of the uppermost cellular layers coupled with a liberation of the central hemoglobin residue which can also form a circular coagulate within the fixated membrane. The minimal amount of sublimate per cell still causing hemolysis is about 1.2 times 0.00000001 molecules. In contrast in HgCl2, ZnSO4 and Pb(NO3)2 cause only increased rigidity of the membrane. Lead hydroxide and lead phosphate is adsorbed on erythrocytal membranes. The embedding of lead in the membrane can be observed ultramicroscopically.

14580 APTIC NO. 32470

Kamel, Aida M., Norman D. Weiner, and Alvin Felmeister

IDENTIFICATION OF CHOLESTERYL NITRATE AS A PRODUCT OF THE REACTION BETWEEN NO2 AND CHOLESTEROL MONOMOLECULAR FILMS. *Chem. Phys. Lipids (Amsterdam), 6(3):225-234, July 1971. 9 refs.*

The effects of the exposure of monomolecular films of various membrane components of cholesterol, dihydrocholesterol, 5-cholesten-3-one, 7-hydroxycholesterol, and 7-ketocholesterol to air and nitrogen dioxide were studied. Exposure to air resulted in expanison of the films in all cases; exposure to NO2 resulted in condensation of all of the films with the exception of 5-cholesten-3-one. The expansion effects were determined to be the result of the formation of various autoxidation products of cholesterol. The condensation effects were caused by the formation and subsequent desorption of cholesterol nitrate. Identification of the products was based on surface pressure-surface area and thin-layer chromatographic evidence. It is conceivable that this interaction may account, in part, for effects such as pulmonary edema, observed when animals are exposed to high concentrations of NO2. (Author abstract)

14581 APTIC NO. 31963

Kondo, Heiichiro, Mitsugu Kondo, Kimio Takeda, Cho Matsuoka, Toshio Kitamura, and Isao Tahara

ON THE HEALTH INJURY FOR THE INHABITANT IN THE VICINITY OF CHROMATE PRODUCING FACTORY. *(Kuromusan seizokojo shuhen jumin no kenkoshogai ni kansuru chosa kekka ni tsuite). Text in Japanese. Tokushima-ken Eisei Kenkyusho Nenpo (Ann. Rept. Tokushima Pref. Inst. Public Health, no. 10:45-65, 1971. 6 refs.*

A chromate manufacturing plant in the Tachibana area of Anan City began operations in May 1969. Eleven months later, following a rise in complaints of pharyngo-laryngeal symptoms among area residents, measurements were made of chromic acid and dust fall in the air in the vicinity of the plant and of the chromate content of plants. Group medical examinations of inhabitants were also undertaken. The atmospheric concentration of chromic acid along the boundary of the plant premises was 1.5 microgram/N cu m below the provisional prefectural standard. Dust fall was within 10 t/sq km/month of the permissible concentration. Chromate compounds in plants were a little higher than in the general area, and necrotic puncta were observed. Although cases of chronic pharyngitis and laryngitis were identified, there were no patients with medium or advanced degrees of disease. Blood and urine analyses yielded no specific findings. Chromate in urine, as determined by supermicroanalysis, was apparently higher than normal in plant workers, but no differences in concentration existed between area residents and those in a control area. Among elementary and junior high school students there was no increase in principal complaints or findings indicative of pharyngitis and laryngitis. Thus, there is no definite health injury due to environmental pollution by chromic acid in the Tachibana area.

14582 APTIC NO. 32230

Kotin, Paul, Hans L. Falk, and Charles J. McCammon

THE EXPERIMENTAL INDUCTION OF PULMONARY TUMORS AND CHANGES IN THE RESPIRATORY EPITHELIUM IN C57BL MICE FOLLOWING THEIR EXPOSURE TO AN ATMOSPHERE OF OZONIZED GASOLINE. III. *Cancer, 2(3):473-481, May-June 1958. 15 refs.*

Mice were exposed to an atmosphere of ozonized gasoline (synthetic smog) and to a control atmosphere of washed air. A significantly greater incidence of pulmonary tumors was noted in the test mice when compared with those maintained in the washed air control atmospheric environment. The pulmonary tumors in the smog chamber mice frequently displayed characteristics considered to be indicative of greater or more exuberant neoplastic growth. These included marked hyperchromatism, pleomorphism of cells, loss of polarity, and papillary growth. The respiratory epithelium in the mice in the smog chamber revealed significant hyperplastic and metaplastic response, which appeared in a much shorter time and to a markedly greater degree than did occasional similar findings in the control mice. The polluted atmosphere appeared to have an inhibitory effect on the the development of spontaneous extrapulmonary tumors in the test chamber animals. The test mice showed a consistent weight deficit of from five to seven g after the twentieth week of exposure. Differences in tumor rates and the production of hyperplastic and metaplastic changes in the bronchial epithelium in a highly refractory inbred strain warrant the consideration of polluted atmosphere characterized primarily by oxidation products of aliphatic hydrocarbons as a factor in human pulmonary carcinogenesis. (Author summary modified)

14583 APTIC NO. 32405

Kuettner K.

THE MORPHOLOGY OF PATHOLOGICAL ALTERATIONS OF THE PERIPHERAL EAR. EXPERIMENTALLY EXPOSED TO REPEATED CARBON MONOXIDE INTOXICATION. *(Zur Pathomorphologie der Veraenderungen am peripheren Hoerogan bei wiederholter experimenteller Kohlenmonoxydintoxikation). Text in German. Z. Laryngologie, Rhinologie, Otologie, 47(10):779-785, Oct. 1968. 22 refs.*

The effect of repeated carbon monoxide intoxications on the cochlear structures in rabbits was studied. Five experimental animals were exposed to carbon monoxide until the onset of gasping and the loss of positional reflexes. This was repeated 40 times, and then the animals were sacrificed. The 10 cochleae embedded in celloidin were serially sectioned. The sensory cells of the organ of Corti showed a striking stability and there was some reduction of the ganglion cell complexes of the spinal ganglia on light microscopy. Morphological changes were demonstrated in the supporting cell system and to a limited extent also in the stria vascularis. (Author summary modified)

14584 APTIC NO. 32124

Lahiri, S., N. S. Cherniack, N. H. Edelman, and A. P. Fishman

REGULATION OF RESPIRATION IN GOAT AND ITS ADAPTATION TO CHRONIC AND LIFE-LONG HYPOXIA. *Resp. Physiol. (Amsterdam), vol. 12:388-403, 1971. 25 refs.*

The effects of chronic and life-long hypoxia on the chemical regulation of ventilation was investigated in four groups of unanesthetized goats using conventional steady state techniques for determining the ventilatory response to hypercapnia at different levels of hypoxia. In the goat, as in man, the effect of acute hypoxia on ventilation could be both independent of (additive), and dependent on (multiplicative), hypercapnia. Neither chronic hypoxia nor life-long hypoxia at 5000 m, modified the characteristic ventilatory response of sea level goats to acute hypoxia. However, in the goats maintained at 5000 m for 10 to 30 days, carbon dioxide sensitivity double and the PA-C02 threshold decreased by 8 mm Hg; concomitantly, arterial P-C02 and (HC03-) reached their nadirs within two days of exposure to altitude but increased gradually thereafter towards sea level values. A similar preservation of the sea level response was also shown in a goat which had life-long arterial hypoxia due to comgenital cyanotic heart disease. Since the ventilatory responses to acute hypoxia and hypercapnia did not decrease as exposure to altitude was prolonged, the gradual return of the P-C02 and (HC03-) towards normal could not be attributed to hyperventilation. On the other hand, because this increase in P-C02 and (HC03-) has not been observed in suborders other than ruminants, it may reflect heightened C02 production by the rumen of the goat at altitude, and/or increased absorption of C02 from the rumen into the

14585 APTIC NO. 31861

Landaw, Stephen A.

KINETIC ASPECTS OF ENDOGENOUS CARBON MONOXIDE PRODUCTION IN EXPERIMENTAL ANIMALS. *Preprint, New York Academy of Sciences, New York, 36p., 1970. 34 refs. (Presented at the Conference on Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)*

Endogenous 14-carbon monoxide was studied in experimental animals following the injection of glycine-2-14 carbon. An early labeled peak (ELP) and a late peak were noted, the latter being exclusively related to the destruction of the initial cohort of red blood cells labeled specifically in the alpha-methene bridge carbon atoms of hemoglobin heme. A mathematical formula is presented by which the late peak can be described and includes parameters describing the size of the cohort, rate of random hemolysis, and phase of senescent death. The ELP consisted of a portion associated with erythropoiesis and a component unassociated with it; the latter comprised approximately 40% of the total ELP in normal rats. The nonerythropoietic component could be increased in magnitude following treatment with phenobarbitol or allylisopropylacetamide, agents which increase non-hemoglobin heme turnovers in mammalian liver. The magnitude of the ELP could be increased following phlebotomy, phenylhydrazine, iron deficiency anemia, and in certain congenital anemias in the mouse. Such stimuli increased different portions of the ELP, suggesting that the erythropoietic component of the ELP consists of a number of discrete processes, including turnover of nonhemoglobin hemes in developing erythroid precursors, ineffective erythropoiesis, and early destruction of reticulocytes by the spleen. (Author summary modified)

14586 APTIC NO. 31881

Martin, A. E.

ASBESTOS IN THE ENVIRONMENT: POSSIBLE HAZARDS TO THE GENERAL POPULATION. *Med. Bull. Standard Oil, New Jersey, 31(2):164-173. July 1971. 19 refs. (Also: Health Trends, Feb. 1970.)*

Differences in results obtained by investigators in different parts of the world make it impossible to state whether there is an increased risk of asbestos workers developing lung cancer in the absence of a concomitant asbestosis or whether there is an increased risk of gastrointestinal cancer from ingestion of asbestos fibers. The most important hazard to the general public is, therefore, mesothelioma. This rare form of cancer is related directly to industrial exposure and indirectly to home contacts with a relative working with asbestos or to residence near an asbestos factory at a time when dust controls were ineffective. A characteristic feature of the disease is the latent period of 30-40 yrs between exposure and development of the disease. In view of the increased use of asbestos over the last 40 years, the number of cases diagnosed in the next three to four decades will likely increase. Since the risk of mesothelioma is probably far greater following inhalation of crocidolite than other types of asbestos fiber, the use of crocidolite should be strictly controlled.

14587 APTIC NO. 32278

McCarroll, James and Michael D. Lebowitz

A COMPARATIVE ANALYSIS OF THE RELATIONSHIP BETWEEN MORTALITY AND AIR POLLUTION AND WEATHER -- II. THE STIMULUS RESPONSE METHOD OF ANALYSIS AND RESULTS. *NAPCA Contract CPA-22-69-126, 18p., 1966 (?).*

NTIS: PB 198516

Using a stimulus-response model, an attempt was made to find a relationship between daily mortality, air pollution, and weather. Multiple regression analysis was performed on data from New York City, Philadelphia, and Los Angeles. The variables shown in previous work to be important in relation to mortality were investigated, and a specific index of the environment was constructed from the more important variables. Different types of abnormal environmental conditions were defined operationally. New York and Philadelphia have primarily reducing type atmospheres. Inversions occur in winter with high levels of sulfur dioxide. They have stormy weather which could affect mortality and they may have photooxidant type conditions in the summer. Los Angeles has photooxidant conditions in the summer, sunny days with inversions, and high levels of oxides of nitrogen and carbon monoxide. Days of abnormal environment and days of excess mortality were examined over time; individual days of abnormal environment were often continguous. Days of similar types of abnormal environment tended to be clustered. Episodes, which are the blocks of contiguous days of abnormal environment, are called stimuli. The lengths of the stimuli were then examined to determine the criterion of separation of stimuli. Stimuli and responses were examined over time, and relationships between them are discussed.

14588 APTIC NO. 31877

McCarroll, James R. and Michael D. Lebowitz

A COMPARATIVE ANALYSIS OF THE RELATIONSHIP BETWEEN MORTALITY AND AIR POLLUTION - WEATHER. *Washington Univ., Seattle, Dept. of Environmental Health, NAPCA Contract CPA-22-69-126, 25p., 1970. 34 refs.*

NTIS: PB 198515

Multiple regression analysis, with lags, was performed on daily mortality, air pollution, and weather variables for three United States cities (New York, Philadelphia, and Los Angeles). Relationships between mortality and air pollution were found for all three cities. These relationships were consistent within cities, by season. They were also consistent between cities, allowing for generalization about the relationship: daily mortality is associated with air pollution and weather in urban areas of the U. S. This association can be stated as a formal relationship in time. The effect of pollution and weather on mortality is essentially an immediate one. (Author abstract modified)

14589 APTIC NO. 32213

Miyagishi, T. and H. Hayashi

ELECTRON MICROSCOPIC STUDIES ON CEREBRAL LESIONS OF RATS WITH EXPERIMENTAL CARBON MONOXIDE POISONING. *Seishin Shinkeigaku Zasshi (Psychiat. Neurol. Japan.), vol. 70:812-824, Sept. 1968. 22 refs. Translated from Japanese. Sanzare Assoc., Inc., Philadelphia, Pa., 22p. (Presented at the Japan Nerve Pathological Society, 7th, 1966.)*

Electron microscopy was utilized to investigate brain disorders in rats with acute or chronic carbon monoxide poisoning. Cerebral cortex nerve cells, glia cells, capillary vessels, and neurophils were examined along with myelinated and nonmyelinated nerve fibers in the cerebral substantia alba. Cerebral disorder was more extensive and stronger in the substantia alba than in the cortex, and generally more serious in cases of chronic poisoning. Enlargement and splitting of the entoplasmic recticulum was observed in the cortex. As this denaturation proceeded, nerve-cell electron density increased and the nucleus became irregular in form. There was no abnormality in capillary vessels or mitochondria. In the substantia alba, destruction of the normal myelin sheath structure and separation and enhomogenization of myelin sheath layers were observed, as was axion destruction and shrinking. The cerebral disorders are not totally explained by low oxygen due to carboxyhemoglobin. Other contributing factors may be the antiblood circulation factor of carbon monoxide and the lyophobity against iron of cytochrome oxide of carbon monoxide.

14590 APTIC NO. 32017

Morley, R. and S. J. Silk

THE INDUSTRIAL HAZARD FROM NITROUS FUMES. *Ann. Occupational Hyg., vol. 13:101-107, 1970. 18 refs.*

The chemistry and toxicology of nitrous fumes are discussed. The inhalation of nitrous fumes which contain nitric oxide, nitrogen dioxide, nitrous anhydride, dinitrogen tetroxide, and nitric anhydride may predispose people to subsequent pneumonia. Details of nitrous fume cases in Britain in the past 10 years are given and correlated with a recent environmental survey carred out in shipyards and repair yards along the northeast coast of England. The results show that the nitrous fume is produced primarily in welding and particularly in cutting and burning, where it is present even when the flame is not in contact with the metal. Chemical processing can also be a source. (Author abstract modified)

14591

APTIC NO. 32484

Nagel, S.

ENVIRONMENTAL PROTECTION VS. ECONOMIC GROWTH. *(Umweltschutz kontra Wirtschaftswachstum). Text in German. Umwelt (Duesseldorf), 1(4):13-15, Aug. 1971.*

Economic growth has increased the problem of air pollution and stimulated the need for environmental protection. More people died in 1961 during the smog condition in the Ruhr valley than had been statistically predicted. Air pollution increases the reaction of the lymphatic apparatus and causes a decrease in the red blood cells, thus retarding the physical development of children. Respiratory diseases are much more frequent in polluted areas than in nonpolluted areas. Carbon monoxide and organic compounds in the air, even in minute fractions, reduce the ability of a subject to concentrate. The inhalation of acidic aerosols, now common throughout most of Europe, causes the increased retention of dust. Lead penetrates into the lungs; as much as 90% of it can be stored in the bones, and during stress or fever it enters the bloodstream. Carcinogenic substances are also in the atmosphere. Maximum allowable emission standards have been set for some pollutants. The automobile industry, lacking initiative in the past, is working to control exhaust gas emissions. Automotive exhausts, which contribute CO, hydrocarbons, and 95% of the lead in the air, will reduce emissions over the next five years.

14592

APTIC NO. 32413

Nettesheim, P., M. G. Hanna, Jr., D. G. Doherty, R. F. Newell, and A. Hellman

EFFECT OF CHRONIC EXPOSURE TO AIR POLLUTANTS ON THE RESPIRATORY TRACTS OF MICE: HISTOPATHOLOGICAL FINDINGS. *National Cancer Inst., Bethesda, Md. and Atomic Energy Commission, Washington, D. C., Proc. Conf. Morphol. Exptl. Respirat. Carcinogenosis, Gatlinburg, Tenn., 1970, p. 437-448. 9 refs. (May 13-16.)*

Specific-pathogen-free mice were chronically exposed to filtered air, chromium oxide dust, or artificial smoke. Some of the animals were pre-exposed to PR 8 influenza virus and 100 R of whole-body X-radiation. The aim of the experiment was to determine the possible carcinogenic or cocarcinogenic effects of these agents on the respiratory tract. The results show that irradiation and chronic exposure to smog increase the incidence of lung tumors significantly. Under the experimental conditions, a combination of treatments had no additive or potentiating effects. Histopathological findings of particular significance were goblet-cell metaplasia in the small airways after influenza virus infection and disorganization at the bronchiolar-alveolar junctions after chronic exposure to artificial smog. Cell proliferation was found to be increased in large and medium bronchi after long-term exposure to artificial smog. After infection by influenza virus, distribution and elimination of inhaled chromium oxide dust were altered. (Author abstract modified)

14593

APTIC NO. 31900

Nose, Yoshikatsu, Yoshimitsu Nose, Kitsuko Nose, and Kazuko Yoshizaki

RELATIONSHIP BETWEEN AIR POLLUTION AND THE INCIDENCE OF ASTHMATIC PATIENTS. *(Taikiosen to zensokukanja hasseihindo tono kankei). Text in Japanese. Minzoku Eisei (Human Hyg.), 36(6):212-213, Nov. 1970. (Presented at the Japan Society of Race Hygiene, Annual Meeting, 35th.)*

The relationship between air pollution and chronic obstructive respiratory disturbances was examined according to sex and age in three-year olds (15,000), six to 11 year olds (27,000), and adults over 40 (15,000) in five cities of Yamaguchi Prefecture: Ube, Onoda, Mine, Tokuyama, and Nanyo. The mortality rate for bronchitis decreased sharply as dust pollution was replaced by gas pollution. Less of a decrease was observed for mortality from asthma. The mortality rate of asthma relative to that of bronchitis is increasing yearly. A positive correlation was observed between the air-pollution level (volume of dust fall and sulfur dioxide concentration), medical histories and incidence of obstructive respiratory diseases according to city, district, age and sex, in subjects over 40.

14594

APTIC NO. 32214

Petrilli, F. L. and G. Cavallaro

MEDICAL AND SOCIAL SIGNIFICANCE OF CHRONIC RESPIRATORY DISEASES AND THEIR REHABILITATION IN THE ELDERLY. *(Importanza medico sociale delle pneumopatie croniche e della loro riabilitazione nell anziano). Text in Italian. G. Gerontol., no. 16:407-421, 1968. 32 refs.*

Recommendations are presented for the rehabilitation of geriatric patients affected by chronic respiratory diseases. A total of 1042 patients were studied including 742 men and 300 women, 352 older than 60 years of age. They suffered from chronic bronchitis, asthma, lung tuberculosis, bronchiectasis, emphysema, lung cancer, and infections. Air pollution, occupational hazards, and cigarette smoking were the main causes in the etiology of the chronic respiratory diseases. Measures directed against these factors, such as air pollution control and health education are considered essential for the prevention of these conditions. The creation of medical facilities for the elderly, with adequate equipment and staff, removal of geriatric patients to areas with mild climate, and satisfactory medical insurance programs are some of the most urgent measures for the rehabilitation of the elderly with respiratory illness.

14595

APTIC NO. 31738

Petry, Jan Krzysztof

THE EFFECT OF SELENIUM (SE) ON THE BLOOD SERUM PROTEIN LEVELS IN OCCUPATIONAL CONTACT. *Przeglad Lekar., 26(6):552-555, 1970. 16 refs. Translated from Polish. Mundus Systems, McGregor, and Werner, Inc., Washington, D. C., 13p.*

The dynamic development of the electric telephone and teletype industries has resulted in the necessity of organizing industrial enterprises which utilize raw materials and elements whose effect on the human organism is insufficiently known. As selenium found its application in the production of various subsystems indispensable in almost all telephone and teletype equipment, an investigation was undertaken to determine the effect of selenium and its compounds on the blood serum protein levels of workers who come in contact with them. Although the amounts of selenium and its compounds did not exceed the allowable concentrations, except for the area of the melting shop, there were substantial changes of blood serum protein levels recorded in exposed workers. A statistically significant acceleration of the Biernacki reaction in a short time after a person started working in the Selenium Department could be attributed to the presence of Se in the red blood cells, in the blood plasma, and in the blood serum protein. A lower albumin level also occurred in workers who were exposed to Se.

14596

APTIC NO. 32421

Raule, A. and G. Morra

PRELIMINARY INVESTIGATIONS OF PREHYPOPHYSEAL GONADOTROPIC FUNCTIONING IN LEAD POISONING. *(Prima ricerche sulla funzionalita gonadotropica preipofisaria negli intossicati da piombo). Text in Italian. Med. Lavoro (Milan), 43(6-7):261-265, 1952. 19 refs.*

Prehypophyseal gonadostimulin eliminated in the urine was biologically determined in twelve cases of lead poisoning, following the method of Varney and Koch. In eight cases, insufficient urinary elimination of the gonadotropic substances was related to the intensity of the lead absorption and the gravity of the clinical picture of poisoning. The hypothesis that insufficiency of the prehypophyseal gonadotropic secretion represents a deviation of the prehypophyseal substances in response to the toxic stimulus of the lead, as occurs in the general adaptation syndrome, is examined.

14597 APTIC NO. 32216

Richet, G., C. Albahary, L. Morel-Maroger, P. Guillaume, and P. Galle

RENAL CHANGES IN 23 CASES OF OCCUPATIONAL SATURNISM. *(Les alterations renales dans 23 cas de saturnisme professionnel). Text in French. Bull. Mem. Soc. Med. Hop. Paris, 117(5):441-466, 1966. 44 refs.*

Renal clinical manifestations of lead poisoning including the urinary syndrome, cardiovascular involvement, the metabolism and excretion of uric acid, and electron microscopic results of renal biopsies of 23 cases of occupational saturnism acquired by up to 23 years of contact with lead are analyzed. The urinary syndrome was limited in four cases to an often intermittent mild proteinuria of less than one g/24 hours. A tendency to hypertension frequently existed, but malignant arterial hypertension was not observed. A definite tubular involvement existed, manifested by the presence of inclusions in certain nuclei. This anomaly was observable by an optical microscope as siderosomes in the cytoplasma, deformed mitochondria, and other modifications. These lesions are not accompanied by any manifestations of a proximal tubular syndrome during subclinical infant saturnism, except perhaps by hypophosphatemia with elevated phosphorus clearance. Renal insufficiency was found in only three cases of protracted lead poisoning. One case ended fatally at the age of 32.

14598 APTIC NO. 32432

Saidel, Gerald M., Thomas C. Militano, and Edward H. Chester

PULMONARY GAS TRANSPORT CHARACTERIZATION BY A DYNAMIC MODEL. *Resp. Physiol. (Amsterdam), vol. 12:305-328, 1971. 30 refs.*

A mathematical model is developed which describes and predicts pulmonary transport of molecular nitrogen and carbon monoxide. The model is structured as a system of five well-mixed compartments, four of which have variable volumes, arranged in parallel and series. For this structure, the unsteady, mass-balance equations are derived and the effect of parameters investigated. The model may be used to simulate experiments of nitrogen washout and carbon monoxide uptake with normal subjects and those with chronic obstructive lung disease. With each subject, these experiments are conducted at several levels of tidal volume and frequency under controlled conditions. When all experiments of a subject are simulated, a set of parameter values is obtained that characterizes the volume and distensibility distributions in airways and alveoli and the carbon monoxide mass transport across the pulmonary membrane. The model has been applied to analyze the differences between normal subjects and those with chronic obstructive pulmonary disease. The parameters yield quantitative information about normal transport which is caused by greater volume inhomogeneities, more distensible airways, and apparently less effective surface area of the membrane. (Author abstract)

14599 APTIC NO. 32468

Salvaggio, John, John Seabury, and Enno A. Schoenhardt

NEW ORLEANS ASTHMA. V. RELATIONSHIP BETWEEN CHARITY HOSPITAL ASTHMA ADMISSION RATES, SEMIQUANTITATIVE POLLEN AND FUNGAL SPORE COUNTS, AND TOTAL PARTICULATE AEROMETRIC SAMPLING DATA. *J. Allergy Clin. Immunol., 48(2):96-114, Aug. 1971. 31 refs.*

A two year study was made of the relationship between climatologic variables, semiquantitative rotoslide pollen and fungal spore aerometric sampling data, and emergency room asthma admission rates at New Orleans Charity Hospital. Suspended particulates, sulfates, benzene-soluble organics, and dust fall were also measured. As interrelationship between certain climatological factors, high airborne spore and pollen concentrations, and asthma admission rates was noted. Large asthma epidemics (above 40 asthma admissions per 24 hours) occurred almost exclusively from June through December and in greater magnitude during September, October, and November. Higher summer asthma admission rates were significantly associated with high total spore and pollen, basidiospore-like, and small spore rotoslide counts. Asthma epidemics occurring during the peak September and October local ambrosia pollination season were not necessarily associated with sudden influxes of Ambrosia pollen, but there was a significant relationship between high daily asthma admission rates (above 20 daily asthma admissions) and 24 hour rotoslide Ambrosia counts during September and early October. Asthma epidemics of considerable magnitude occurred in late October and November immediately following the peak Ambrosia pollination season. High total and basidiospore-like rotoslide spore concentrations, plus heavy deposits of amorphous chitinous material resembling plant debris were noted on slide samples during these episodes. Humidity, barometric pressure, wind and temperature were the climatic variables. (Author abstract)

14600 APTIC NO. 32406

Sandage, Curtis

TOLERANCE CRITERIA FOR CONTINUOUS INHALATION EXPOSURE TO TOXIC MATERIAL. I. EFFECTS ON ANIMALS OF 90-DAY EXPOSURE TO PHENOL, CC14, AND A MIXTURE OF INDOLE, SKATOLE, H2S, AND METHYL MERCAPTAN. *Midwest Research Inst., Kansas City, Mo., Air Force Contract AF 33(616)-7055, Proj. 7165, Task 716501, ASD-TR-61-519(I) 31p., Oct. 1961. 25 refs.*

NTIS: AD 268783

Physiological changes in rats, mice, and monkeys were studied during continuous 90-day exposures to controlled atmospheres of toxic gases. Concentrations of test chemicals were those recognized as Industrial Threshold Limit Values and included: carbon tetrachloride (25 ppm), phenol (5 ppm), and a mixture of indole (10 ppm), skatole (3 ppm), hydrogen sulfide (20 ppm), and methyl mercaptan (50 ppm). Exposure to the mixture of compounds resulted in the formation of significant amounts of sulfhemoglobin in the animals. A low-grade hemolytic process appeared to exist, but there was no evidence of impairment of hematopoietic function. Lung pathology was observed in 75% of the mice, but was not significant in the other two species. Liver pathology was not evident in rats and monkeys, but existed in 60% of the mice. Autopsy findings did not fully account for the deaths of the animals that died. There were no deaths and no significant pathological findings suggestive of damage due to phenol. As far as hematological and pathological evidence is concerned, CC14 was more damaging than any of the other chemicals. An active hemolytic process probably existed in all animals, but there was no inhibition of erythropoietic function. Liver damage was found in all of the monkeys and rats and in 75% of the mice. The survival of these animals is not in accordance with predictions based on toxicological theory. (Author summary modified)

14601 APTIC NO. 32129

Selander, Stig, Kim Cramer, Birgitta Borjesson, and Gunilla Mandorf

DETERMINATION OF LEAD IN BLOOD BY AUTOMIC ABSORPTION SPECTROPHOTOMETRY. *Brit. J. Ind. Med. (London), vol. 25:209-213, 1968. 9 refs.*

Lead in blood was determined by atomic absorption spectrophotometry using a wet ashing procedure and a procedure in which the proteins were precipitated with trichloroacetic acid. In both methods, the lead was extracted into isobutylmethylketone before measurement, using ammonium pyrrolidine dithiocarbamate as the chelator. The simpler precipitation procedure was shown to give results identical with those obtained with the ashing technique. In addition, blood specimens were examined by the precipitation method and by spectral analysis, which includes wet ashing of the samples, with good agreement. All analyses were done on blood samples from normal persons or from lead-exposed workers, and no additions of inorganic lead were made. The relatively simple protein precipitation technique gave accurate results and is suitable for the large-scale control of lead-exposed workers. (Author abstract modified)

14602 APTIC NO. 32239

Shabad, L. M. and L. N. Pylev

MORPHOLOGICAL LESIONS IN RAT LUNGS INDUCED BY POLYCYCLIC HYDROCARBONS.

National Cancer Inst., Bethesda, Md. and Atomic Energy Commission, Washington, D. C., Proc. Conf. Morphol. Exptl. Respirat. Carcinogenesis, Gatlinburg, Tenn., 1970, p. 227-242. 20 refs. (May 13-16.)

NTIS: CONF-700501

The morphological structure and stages of lung tumor development in rats after repeated intratracheal instillations of polycyclic hydrocarbons, together with some adsorbents (India ink powder and carbon blacks), are discussed. There are four stages in the development of epithelial tumors: diffuse irregular hyperplasia, focal nodular proliferation, benign tumors, and malignant tumors. Bronchial lesions were observed very often in the first precancerous stage; they were located in both large and small bronchi and were characterized by papillomatous and polypous growths which consisted of cylindrical or cuboidal cells with brightly colored protoplasm and hyperchromatic nuclei. These cells were arranged in several layers. There are two kinds of precancerous lesions in the lung from the second stage which determine in principle the morphological structures of the future malignant tumor. Adenomatous growths can cause adenocarcinomas, and focal metaplastic proliferations of bronchial epithelium can be a base for squamous cell carcinoma. (Author abstract modified)

14603 APTIC NO. 32084

Shatskaya, N. N. and A. A. Orlov

THE FUNCTION OF THE BLOOD COAGULATION AND ANTICOAGULATION SYSTEMS IN CHRONIC BERYLLIOSIS.

Gigiena Truda i Prof. Zabolevaniya, vol. 12:16-20, 1968. 12 refs. Translated from Russian. Mundus Systems, McGregor, and Werner, Inc., Washington, D. C., 10p.

Chronic beryllíosis manifests itself by allergic reactions which resemble some forms of pulmonary vascularitis, a collagen disorder which involves the connective tissues and the blood vessels. When 52 persons working with relatively insoluble beryllium compounds were observed, sharp decrease of thromboplastic activity of the blood was noted, as well as increased fibrinolysis, and a tendency towards hyperheparinemia.

14604 APTIC NO. 32435

Sherwin, Russell P. and Valda Richters

LUNG CAPILLARY PERMEABILITY. NITROGEN DIOXIDE EXPOSURE AND LEAKAGE OF TRITIATED SERUM.

Arch. Internal Med., 128(1):61-68, July 1971. 16 refs. (Presented at the Hanford Biology Symposium on Pollution and Lung Biochemistry, Annual, 10th, Richland, Wash., June 5, 1970.)

A method was developed for detection of altered lung capillary permeability and epithelial cell damage by low level of nitrogen dioxide. Leakage of tritiated serum, injected intravenously before or at intervals after NO2 exposure, was detected by scintillation counting of dialyzed pulmonary lavage fluid. In experiments with mice, elevated readings were obtained for those exposed to continuous low levels of nitrogen dioxide. Determinations were also made of plasma levels and lung tissue content. Although good reproducibility and significant differences were not achieved in respect to the accumulation of reabsorbed serum and its large degradation products in lung tissue, the evidence (including data from ultrastructural autoradiography) serves to encourage further exploration. The results of the lavage fluid study by itself warrant strong consideration of the methodology as a highly sensitive and biologically meaningful indicator of adverse air pollutant levels. (Author abstract)

14605 APTIC NO. 31846

Smith, Thomas J. and Harold J. Paulus

AN EPIDEMIOLOGICAL STUDY OF ATMOSPHERIC POLLUTION AND BRONCHIAL ASTHMA ATTACKS.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 43p., 1971. 19 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-31.)

The occurrence of asthma attacks in a large group of sensitive individuals was monitored and correlated with daily variations in environmental conditions. The weather variables evaluated included daily observation of mean temperature, maximum two-hour temperature drop, rainfall, mean relative humidity, relative humidity range, mean absolute humidity, mean and daily range of barometric pressure, wind speed and direction, and the duration and maximum intensity of temperature inversion. Pollution indices were mean sulfur dioxide concentration, total sulfate particulates, smoke spot index, and suspended particulates. Results showed that interpretation of the asthma incidence correlations was not possible without considering the interrelationships of the environmental factors. Approximately 2.5% of the total variation in asthma incidence was due to temperature-absolute humidity effects and about 4.5% was attributed to the pollutants represented by smoke spot index. The remaining 93% was due to individual sensitivities to specific allergens, respiratory infections, respiratory strain, emotional stress, and individual physical or chemical irritations. No evidence was found to indicate that asthma attacks were induced by particulate or SO2 irritation. The particulate matter-asthma relationship may be due to allergenic compounds rather than nonspecific irritation from inert dust. (Author abstract modified)

14606 APTIC NO. 31731

Srch, Milan

THE SIGNIFICANCE OF CARBON MONOXIDE IN CIGARETTE SMOKE IN PASSENGER CAR INTERIORS.

Deut. Z. Gesamte Gerichtl. Med., 60(3):80-89, 1967. 47 refs. Translated from German. Herner and Co., Washington, D. C., 13p.

The quantity of carbon monoxide from cigarette smoking is determined by the speed of smoking, by the moisture of the tobacco, and by the kinds of tobacco used. Smokers deeply inhaling the smoke have higher carboxyhemoglobin levels than the smokers who merely try to draw the smoke into the mouth. The average value of CO in venous blood of nonsmokers is 0.06 vol %. In a group of 21 smokers with a daily consumption up to 30 cigarettes who did not inhale, after a consumption of a maximum of 10 cigarettes, an average content of 0.12 vol % was found in the blood. After smoking only two cigarettes, the CO in the atmosphere of an automobile exceeded the maximum permissible value and, after smoking 10 cigarettes in 62 minutes, the CO value rose to 0.009 vol %.

14607 *APTIC NO. 31962*

Stoefen, Detlev

EFFECTS OF ENVIRONMENTAL LEAD ON PSYCHE. (Die Auswirkungen des Umweltgifts Blei auf die Psyche). Text in German. Staedtehygiene (Uelzen/Hamburg), 22(8):172-176, Aug. 1971. 34 refs.

The average lead concentration in the population of the Federal Republic of Germany, as expressed by the content of delta-aminolevulinic acid in the urine, already exceeds the pathological threshold limit of a number of investigators. Lead is known to have effects on the nervous system. In London, mentally retarded children who had been given a chelating agent for lead decorporation showed considerable improvement. Metabolism difficulties receded and mental capacities were stimulated.

14608 APTIC NO. 31847

Thind, Gurdarshan S.

ROLE OF CADMIUM IN HUMAN AND EXPERIMENTAL HYPERTENSION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1971. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-30.)*

Acute and chronic investigations conducted in normal rabbits, dogs, human control subjects, and patients with hypertension are reviewed. Cadmium, a common air pollutant, produces persistent hypertension in the rabbit and dog. It is predominantly deposited in the kidney and liver, and to a lesser extent in the blood vessels, of cadmium-hypertensive rabbits. Vascular responsiveness to angiotensin in the cadmium-hypertensive aortic strips was lower than that of strips obtained from control rabbits. The aortic strips also developed lower passive tension on a step-wise increase in the original length of the strips. Administration of cadmium acetate into the renal artery, before the injection of a vasopressor, resulted in a dose-related reversible inhibition of the vasopressor-induced renal vasoconstriction. It is probable that pathophysiological changes in experimental cadmium hypertension would occur in the vascular system and kidney, where cadmium deposition was greatest. Mean plasma cadmium levels were significantly higher in patients with hypertension. A program of detailed epidemiological studies and public health measures is needed for further definition of the role of cadmium in idiopathic human hypertension. (Author abstract modified)

14609 APTIC NO. 32234

Tourangeau, F. J. and Philip Drinker

THE DUST FILTERING EFFICIENCY OF THE HUMAN NOSE. *J. Ind. Hyg. Toxicol., 19(1):53-57, Jan. 1937. 4 refs.*

The nasal resistance to unidirectional airflows of four, eight, and 12 l/min was determined upon normal subjects; the nasal filtering efficiency of the same subjects was then determined at the same rates of airflow. Determinations were made at airflows corresponding to nasal inhalation and exhalation. The dust used was finely divided limestone from which the large particles had been allowed to settle out before any was breathed. In general, nasal efficiencies were found to be less than 30%, indicating that the filtering efficiency of the normal nose is too low to be of importance in preventing fine dust from reaching the lungs. (Author summary)

14610 APTIC NO. 32510

Toyama, Toshio

REPORT ON THE INVESTIGATION CONCERNING EFFECTS OF CARBON MONOXIDE IN THE AIR ON HUMAN BODIES. *(Taikichu no issankatanso no jintai eikyo ni kansuru chosa hokokusho). Text in Japanese. Keio Univ., Tokyo (Japan), Dept of Hygiene. 64p., March 1971.*

Employees of the Transportation Bureau in Tokyo were examined between June and November 1970 to determine the effects of automobile exhaust gases. Subjects were divided into drivers, conductors, and non-drivers. The carbon monoxide concentration in expired air was determined, and a relationship was sought between the amount of C0 and various working conditions, reaction time, fatigue, and the amount of C0 in the atmosphere. Expired air was collected before work, at lunch, and at the end of the working day; it was analyzed by infrared spectrometry. The C0 concentration in the open air of the areas investigated was 5-10 ppm. The mean daily value of C0 concentration for drivers was also classified according to the amount of cigarettes smoked. A minimum value of 15 ppm was found even among non-smoking drivers, a value higher than for non-smokers who are not drivers. Length of employment, height, and body weight did not influence the C0 concentration in expired air. The degree of bus maintenance affected the C0 concentration. While the concentrations were not high enough to affect the nervous system, various subjective symptoms were observed.

14611 APTIC NO. 31830

Truhaut, Rene, Nguyen Phu Lich, and Felix Loisellier

TOXICOLOGY--ON THE EFFECTS OF REPEATED INGESTIONS OF SMALL DOSES OF BORON DERIVATIVES UPON THE REPRODUCTIVE FUNCTIONS OF THE RAT. *(Toxicologie--Sur les effets de l ingestion repetee de petites doses de derives du bore sur les fonctions de reproduction du rat). C. R. Acad. Sci. Paris, vol. 258:5099-5102, May 20, 1964. 5 refs. Translated from French. Leo Kanner Assoc., Redwood City, Calif., 7p.*

In male rats subjected to repeated ingestions of relatively small doses of boric acid and of 5-methyl 5-n-propyl 2-p-tolyl 1,3,2, dioxaborinane (MPTDB), testicular atrophy and lesions of the seminiferous tubules leading to sterility were observed. In the female rat, the same treatment produced no ovarian lesions and did not interfere with fertilization, but the vitality of the offspring was considerably reduced. Concentrations of boron in the offspring revealed that there is passage across the placental barrier of the compounds tested or their metabolites. (Author abstract)

14612 APTIC NO. 32369

Truhaut, Rene, Etienne Comoy, Claude Bohoun, and Marc Bonnay

TOXICOLOGY--ELEVATION OF THE BLOOD UREA LEVEL IN ACUTE DECABORANE POISONING OF THE RAT. THE PREVENTIVE ROLE OF VITAMIN B6. *(Toxicologie--elevation de l uree sanguine du rat dans l intoxication aigue par le decaborane. Role preventif de la vitamine B6). C. R. Acad. Sci. Paris, vol. 268:870-872, Feb. 3, 1969. 11 refs. Translated from French. Leo Kanner Assoc., Redwood, Calif., 5p., April 1971.*

The intraperintoneal injection of decaborane (20 mg/kg) in rats produces in a few hours a marked increase in the blood urea level. This phenomenon does not seem to be caused by renal blockage but rather reflects a profound derangement of the nitrogen metabolism. Vitamin B6 injected an hour before the decaborane prevents this rise in the blood urea but not other early manifestations of toxicity: a fall in the level of catecholamines in the brain and heart tissues and a decrease in the transaminase activity of the blood serum and liver and myocardial tissues. (Author abstract)

14613 APTIC NO. 32122

Turek, Z., A. Frans, and F. Kreuzer

STEADY-STATE DIFFUSING CAPACITY FOR CARBON MONOXIDE IN THE RAT. *Resp. Physiol. (Amsterdam), vol. 12:346-360, 1971. 33 refs. (Presented at the Dutch Physiological and Pharmacological Society, 112th Meeting, Nijmegen, The Netherlands, Oct. 17, 1970.)*

Steady-state diffusing capacity for carbon monoxide was determined in rats anesthetized by pentobarbital at normoxia and hypoxia and in conscious rats at normoxia by three experimental arrangements. The carbon monoxide back pressure was estimated by a method adapted to small animals and its influence was evaluated. There was a significantly higher diffusing capacity, alveolar ventilation, and oxygen uptake in the unanesthetized rats compared with the anesthetized animals at normoxia. A linear regression between diffusing capacity and alveolar ventilation was found in all rats at normoxia. The diffusing capacity measured at hypoxia was higher than in normoxic animals of similar body weight at the same level of ventilation. No significant difference between the previously measured diffusing capacity for oxygen and the present values of the carbon monoxide diffusing capacity in rats of similar body weight was found. The relationship between the diffusing capacity for oxygen measured directly and that calculated indirectly from the diffusing capacity for carbon monoxide is discussed. (Author abstract)

14614 APTIC NO. 32256

Wewer, Bernd

ANALYSIS OF ANIMAL EXPERIMENTS ON THE RETENTION AND ELIMINATION OF CALCIUM FLUORIDE IN THE LUNG (CONTRIBUTION TO FLUORSPAR PNEUMOCONIOSIS). *(Tierexperimentelle Untersuchungen an der Lunge zur Frage der Retention und Elimination von Calciumfluorid (Beitrag zur Pneumokoniose der Flussspatarbeiter)). Text in German. Beitr. Silikose-Forsch. (Pneumokoniose), 22(4):193-235, 1970. 112 refs.*

Experiments were conducted to give quantitative values of calcium fluoride lymph transport from the lung. According to its cytopathogenic effect in pattern experiments, CaF2 was expected to show an increased evacuation effect on the lymphatics. The results of fluoranalysis showed no direct influence of CaF2 on the acute course of fluorspar pneumoconiosis. During the phase of CaF2 inhalation, analysis indicated a marked decrease of retention and, histologically, an interstitial pneumonia and lymphadenitis. When another inhalation followed CaF2 inhalation, elimination of CaF2 increased and evacuation of quartz particles in the lymphatics was limited. The inflammation of the lung tissue caused by CaF2 increased the effect of quartz. Quartz increased the penetration of CaF2 into the pulmonary interstitium, where mixed dust granulomas were formed. The evacuation of quartz particles by the lymphatics was diminished by CaF2. Silicon dioxide could then develop its damaging effects since it was only eliminated from the lung by the bronchial tree to an insignificant degree; this was an especially decisive point in acute fluorspar pneumoconiosis.

14615 APTIC NO. 32265

White, Peter

CARBON MONOXIDE PRODUCTION AND HEME CATABOLISM. *Preprint, New York Academy of Sciences, New York, 20p., 1970. 21 refs. (Presented at the Conference on Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)*

A study of carbon monoxide metabolism established that CO was produced during the physiologic catabolism of hemoglobin and other heme compounds. In normal humans, the degradation of the hemoglobin of senescent red cells at the end of their normal life span accounted for approximately 75% of total endogenous CO production. Catabolism of heme-containing compounds within the liver also gave rise to CO, and under the influence of drugs, such as phenobarbitol, which induce hepatic heme synthesis, or in the presence of porphyria cutanea tarda, the liver could become a major source of endogenous CO. The bone marrow, a third site for CO production, may similarly become a major source of CO in hematologic disorders, such as sideroblastic anemia, which are characterized by ineffective ertyhropoiesis. (Author summary modified)

14616 APTIC NO. 32263

Winnicki, Stefan

DYNAMICS OF BRONCHIAL DEVELOPMENT IN CHILDHOOD. ANALYSIS OF DIVISIONS, NUMBER AND SITES OF ORIGIN OF BRONCHI IN ROENTGENOGRAMS, WITH SPECIAL REFERENCE TO DEVELOPMENTAL ANOMALIES. (PART III). *Pol. Rev. Radiol. Nucl. Med. (English translation from Polish of: Pol. Przeglad Radiol. Med. Nuklearnej), 34(2):167-177, 1970.*

NTIS: TT 70-55002/2

The caliber of the main and intermediate bronchi increased gradually until the age of about 21 years, with the fastest rates between the ages of 0 and 6 years. Increase in the caliber of the lobar and lingular bronchi was much slower between the ages of 7 and 15 years. Bronchographic observations provided no evidence of increase in the number of bronchial branches in the period of growth in childhood. Division and numbers of bronchi were very variable, especially in the lower lobes on the right side, where typical patterns were observed in only 7.4% of the cases. Anatomic variations of bronchi were observed in 3.9% of the analyzed material. They were most frequent in the right upper lobe (7.3% of the cases). (Author summary modified)

EFFECTS-PLANTS AND LIVESTOCK

14617 APTIC NO. 32337

Adamowicz, Stanislaw

CHANGE IN AFFORESTATION OF THE UPPER SILESIAN INDUSTRIAL BASIN. *(Waldumbau im oberschlesischen Industriebezirk). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 389-406. 13 refs. (Sept. 9-14.)*

Woods in the Upper Silesian industrial basin cover an area of 69.677 ha. The vegetation period extends over 210-220 days, the median yearly temperature is 7-8 C and the annual rainfall 646-732 mm. The degree of damage to these woods depends on their composition, distance from a source of pollution, nature and concentration of the pollutants, and on-site conditions. Contributing factors include changes in water balance caused by mining operations and morphologic surface changes (cave-ins and surface mining). Hydrologic changes contribute to reduced growth gains, lower biological resistance, and deterioration of tree stands. Of the entire wooded area 30,639 ha suffered slight damage, 20,171 ha suffered medium damage, and 5974 ha suffered severe damage, and the deterioration is increasing at an alarming rate. Of the wooded area 8172 ha of the stands are less than 20 years old, 25,343 ha are less than 60 years old, and 23,269 ha are over 60 years old; 17,092 ha are conifers, 34,851 ha are mixed woods, and 4841 ha are deciduous woods. Guidelines governing planning designed to raise the productivity of these woods by reforestation with resistant species are outlined, including replacement of spruce and pine stands with Larix europaea, Pinus nigra, Pseodotsuga doug, Quercus ruber, Q. pedunenculata, and other resistant species.

14618 APTIC NO. 32284

Barkman, J. J.

THE INFLUENCE OF AIR POLLUTION ON BRYOPHYTES AND LICHENS. *Council of Europe, Committee of Experts on Air Pollution, Air Pollution*

Proc. First European Congr. Influence Air Pollution Plants Animals, Wageningen, Netherlands, 1968, p. 197-209. 20 refs. (April 22-27.)

Since only few data are known on damage caused by air pollution to algae and fungi, its effect on bryophytes and lichens, especially epiphytes, is discussed. The decline of the epiphytic flora and vegetation in the Netherlands during the last hundred years and the formation of epiphytic deserts in and around towns in Europe and America are discussed. Both dryness of town climate and air pollution are responsible, with the latter being the main factor. The physiologic basis of the high sensitivity (compared with flowering plants) of bryophytes and lichens to air pollution, the influence of rain on pollution effects, and the increased acidity of plants and substratum caused by sulfur dioxide are considered. Bryophytes and lichens show a wide range of specific sensitivity; therefore, epiphytic vegetation maps can give an approximate idea of the gradation of pollution levels and their pattern in a certain area. This is elucidated by the example of Limburg, Belgium. (Author abstract modified)

14619 APTIC NO. 32159

Crocker, William, P. W. Zimmerman, and A. E. Hitchcock

ETHYLENE-INDUCED EPINASTY OF LEAVES AND THE RELATION OF GRAVITY TO IT. *Contrib. Boyce Thompson Inst., vol. 4:177-218, 1932. 25 refs.*

A total of 202 different species of plants were tested for ethylene-induced epinasty. Ethylene-induced epinasty was seen in 89 species; 113 did not show any signs. Buckwheat, African marigold, sunflower, and Chenopodium album showed leaf epinasty in 0.05 ppm ethylene in air. Tomato petioles showed a decided epinasty in 0.1 ppm ethylene in air with 48 hrs exposure. There was also considerable variation in the type of response shown by the leaves of various plants. In the tomato, the upper three or four leaves showed epinastic bending throughout the length of the petioles. The older leaves bent only near the base of the petioles. When removed from the gas, the young leaves recovered their original position after a few hours, the middle-aged leaves recovered only in part and more slowly, and the oldest leaves showed little recovery. Motion pictures showed that the same concentration of ethylene may act as an anesthetic on one portion of the plant and as a growth stimulus on another part. Thirty eight gases were tested as to their ability to induce leaf epinasty in the tomato. The effective gases were ethylene, acetylene, propylene, carbon monoxide, and butylene. All were carbon gases with unsaturated bonds. In the olefins, the effectiveness decreased with an increase in the number of carbon atoms in the chain. Ethylene-induced epinasty of petioles was shown to be intimately tied to the orientation of the petioles to the direction of the pull of gravity. It was certain that ethylene does not act directly in inducing epinasty of petioles but that it acts indirectly, probably by modifying the equilibrium position of the petiole with gravity.

14620 APTIC NO. 32358

Davidson, O. W.

EFFECTS OF ETHYLENE ON ORCHID FLOWERS. *Proc. Am. Soc. Hort. Sci., vol. 53:440-446, 1949. 3 refs.*

Orchid flowers were exposed to ethylene in several air-tight chambers. The temperature was maintained at 68 to 70 F at night and 75 to 80 F during the day. The concentrations of ethylene used varied from a maximum of 10 ppm to a minimum of 0.001 ppm. The minimum time of exposure was eight hours and the maximum was 48 hours. Opening flower buds of orchids exposed to ethylene in concentrations exceeding 0.1 ppm for periods longer than eight hours were severely injured by the gas. The injury resulting to sepals and petals was more intense than usually occurs in orchid greenhouses. Flowers which were almost fully opened when exposed to 10 ppm ethylene failed to mature normally and collapsed within a few days; their pedicels and those of the opening buds developed an abnormal yellow tinge in response to this concentration of gas. Half-open blooms withstood one ppm for 20 hours, but had their development arrested by exposure to five ppm for the same time. A 0.1 ppm, a concentration of ethylene in the atmosphere for a period of eight hours produced typical and extensive dried-sepal injury. Exposure to 0.04 ppm for 16 hours or more usually caused severe injury to petals and prevented a majority of buds from opening. A 0.01 ppm concentration of ethylene for 12 to 24 hours caused slight but definite injury. A 0.001 ppm concentration for 24 hours failed to injure any flowers tested.

14621 APTIC NO. 32334

Donaubauer, Edwin

SECONDARY DAMAGE IN REGIONS OF AUSTRIA EXPOSED TO POLLUTION. DIFFICULTIES IN DIAGNOSIS AND ASSESSMENT. *(Sekundaerschaeden in Oesterreichischen Rauschschadensgebieten. Schwierigkeiten der Diagnose und Bewertung). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland. 1968, p. 277-284. 10 refs. (Sept. 9-14.)*

Secondary damage from pollution most frequently occurs through sunburn on peripheral susceptible tree stands in clearings of wooded areas. Such trees, damaged by the sun, attract pests and die. This applies especially to pine stands. In the pollution exposed areas of Aichfeld near Judenburg and Gailitz-Arnoldstein, needles of mature pine stands suddenly turned brown in 1963 following the appearance of an additional pollutant (hydrofluoric acid) into the already sulfur dioxide-polluted atmosphere (first area) and intensification of SO2 emission (second area). A contributing factor was an exceedingly cold winter with temperatures 4 to 5 C below the long-term average. Pollution- exposed stands are more susceptible to infestation with the fungus Armillaria mellea which causes great damage in Austria to pine, spruce, and deciduous tree stands. Other pests which proliferate in pollution-damaged stands are Pissodes piceae, Cryphalus piceae, Ips typographus, and Pissodes harcyniae. Generally it is not easy to prove a causal relationship between emission and secondary damge: detection of damage in a pollution-exposed area is not sufficient proof. The task is easier where identical or similar stands in unpolluted areas are available for comparison.

14622 APTIC NO. 32289

Ender, F.

THE EFFECTS OF AIR POLLUTION ON ANIMALS. *Council of Europe, Committee of Experts on Air Pollution, Air Pollution Proc. First European Congr. Influence Air Pollution Plants Animals, Wageningen, Netherlands, 1968, p. 245-254. 12 refs. (April 22-27.)*

The most important problem concerning damage to animals by air pollution is the poisoning of domestic animals by fluorine in smoke, gas, or dust from various industries. The extent of the problem is illustrated by evidence from the international literature and studies conducted in Norway, where the postwar growth in aluminum production has produced a tremendous rise in livestock fluorosis. The total quantity of fluorine in gases emitted by an aluminum plant is roughly 20 kg/ton of aluminum produced. Emitted with the smoke and other damaging compounds such as gaseous hydrofluoric acid and fluosilicic acid, dust-containing cryolite, and aluminum- and calcium-containing fluorides. The geographic location as well as topographic conditions near the aluminum factories have a striking influence on the fluorine contamination of soil and vegetation in the surroundings. The risk of fluorine injuries in neighboring valley districts is far greater with factories located at the bottom of deep, narrow, U-shaped valleys than with those on open, unsheltered ground. Despite installation of gas purification procedures, it is impossible to completely prevent the escape of fluorine-containing gases from doors, ducts, and windows in electrolysis halls. With respect to the defluorination of forage, good results have been obtained by treating contaminated grass with a mixture of diluted sulfuric acid and hydrochloric acid, or by using formic acid.

14623 APTIC NO. 32088

Ermarkov, V. V. and V. V. Koval skiy

THE BIOLOGICAL SIGNIFICANCE OF SELENIUM: SELENIUM ENDEMIC DISEASES. *(Biologicheskoye znacheniye selena: selenoviye endemii). Usp. Sovrem. Biol., 65(2):267-284, 1968. 163 refs. Translated from Russian. Leo Kanner Assoc., Redwood City, Calif., 40p., May 1971.*

Selenium influences cell growth and mitosis in organisms. There is a functional antagonism between sulfur and selenium, and under certain conditions selenium replaces sulfur in its organic compounds. The biochemical functions of selenium, on the strength of its physiochemical characteristics and its small amount in organisms, must lie in its role as catalyst. The effect of additions of selenium to the rations of animals is discussed. The interest and relationship of selenium with the processes of phosphorylation are described. The parallelism in effect between selenium and vitamin E is not clear with the exception of their common antioxidant behavior. The favorable therapeutic effect of small amounts of selenium in white sac sickness, its inhibiting of cell growth and capacity to protect biological systems from radiation are examined. (Author summary modified)

14624 APTIC NO. 32323

Ewert, E.

THE EFFECT OF HYDROCHLORIC ACID ON PLANTS IN EXPERIMENTS. *(Die Einwirkung von Chlorwasserstoff auf Pflanzen im Experiment). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 197-208. 6 refs. (Sept. 9-14.)*

The damaging effect of hydrochloric acid on test plants was examined in connection with damage to vegetation in areas near chemical and potassium factories. Tents of transparent, thin polyethylene sheet about 2.8 m long, 2.0 m wide, and 1.0 m high were used as gastight enclosures, in which up to 25 plant pots could be accommodated for each experiment. Agricultural and forest plants were exposed to test gas mixtures with hydrochloric acid concentrations from 0.05 mg/cu m to 2.0 mg/cu m, for test periods between 50 and 470 hours. Visible damage occurred primarily at the tips and edges of leaves and needles in the form of brown necrosis. Under conditions of intermittent gassing no damage occurred when the maximum permissible emission concentration of 0.05 mg/cu m was not exceeded. The tested plant varieties were divided into three groups according to their sensitivity to HCl. At a concentration of 2.0 mg HCl/cu m, leaves of beans or peas showed the first symptoms of necrosis after eight hours. If removed from the test enclosure at that stage, the damaged leaves usually died off, but three to four weeks later new, undamaged leaves were produced by the plant. With the same concentration and an exposure of about 100 hours, all plants tested died. When exposed continuously, the test plants accumulated chloride in concentrations of up to 2% of the dry leaf material, equivalent to about 20 times the chloride content found in normal undamaged plants of the same type.

14625 APTIC NO. 32327

Garber, Kurt

STUDY OF DAMAGE TO FOREST STANDS IN THE VICINITY OF A POTASH PLANT. *(Untersuchungen zur Frage der Schaedigung von Waldbestaenden in der Naehe eines Kaliwerkes). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 429-438. 10 refs. (Sept. 9-14.)*

The effect of emissions from a potash plant situated in the southern part of Lower Saxony on surrounding fir and beech tree stands was studied. Besides sulfur dioxide, plant emissions included 80,000 cu m/hour of drying plant flue gas containing 0.8-1 g/cu m potassium chloride. In 1964 the height of the drying plant stack was increased from 52 m to 120 m. Damage which before 1964 had reached 800 m from the plant, after 1964 spread out to a distance of up to four km. Conifer needles turned brown and leaves manifested signs of peripheral necrosis. Damaged needles had a chlorine content of 0.38% Cl while needles from unpolluted areas contained 0.14%. The Cl:K ratio in damaged needles was 1:2.6, in undamaged needles 1:4.5. Similar results were found in leaves of deciduous trees. The accumulation of Cl and K can also occur from soil effects. Fast-growing species are more susceptible to pollution damage than slow-growing varieties and contained higher Cl, K, and Na levels. Populus tremula, P. canadensis, P. alba, P. canescens, and Ulmus campestris were highly resistant to potash, other resistant species included Quercus rubra, Ulmus americanus, medium resistant Populus nigra, Acer pseudoplatanus, and Fraxinus exelsior.

14626 APTIC NO. 32290

Gilbert, O. L.

THE EFFECT OF SO2 ON LICHENS AND BRYOPHYTES AROUND NEWCASTLE UPON TYNE. *Council of Europe, Committee of Experts on Air Pollution, Air Pollution Proc. First European Congr. Influence Air Pollution Plants Animals, Wageningen, Netherlands, 1968, p. 223-235. 18 refs. (April 22-27.)*

Deterioration of lichens and bryophytes on trees, asbestos roofs, sandstone wall tops, and in grassland was investigated in Newcastle upon Tyne by examining the plants along a 32-km belt transect stretching from an area of pure air to the center city, where the sulfur dioxide annual average is 200 microgram/cu m. The majority of species decrease in abundance, vigor, and diversity as the town is approached. Ultimately, at an annual SO2 average above 0.016 ppm, an area of very low species diversity is reached. Defined thus, a desert of about 500 sq mi is centered on the Newcastle Coalfield. It can be limited very precisely by mapping Grimmia pulvinata or Parmelia saxatilis. Two environmental factors can alleviate the effect of SO2 pollution: shelter by causing a reduction in SO2 levels, and high pH, by influencing the degree of ionization and rate of oxidation of sulfite. Experimental evidence suggests that accumulation of sulfur in the thalli of lichens is an active biological process. (Author abstract modified)

14627 APTIC NO. 32326

Godzik, Stefan and Zdzislaw Harabin

FORESTS IN THE KATOWICE-MYSLOVICE AREA AT THE END OF THE 19TH CENTURY AND TODAY. *(Waldbestaende im Raume Katowice und Myslowice zu Ende des XIX Jahrhunderts und gegenwaertig). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 355-370. 2 refs. (Sept. 9-14.)*

In 1893 Reuss published a study of pollution damage to forests in the Katowice-Myslowice industrial district which contained a wealth of information about the prevailing condition, composition, quality, and other characteristics of the forests at that time. To the extent possible, this study was duplicated recently and results compared. The forest area investigated by Reuss and in the recent study was 3042 ha. The yearly SO2 emission estimated by Reuss was 35,600 tons. The comparison of studies indicates (1) increased emission in the last few decades has considerably reduced the periodic increase in tree diameter of trees of comparable age (while in 1968 the loss of the periodic, 3-year increase in diameter of 43-year old pine trees due to pollution was 46% while the same decrease on 43-year old pine trees 50 years ago was only 3%), (2) that a gradual dying-off of whole stands is taking place, and (3) that fir trees are less resistant to pollution than pine trees. This last conclusion is based on the change in the composition of the forests. The continued cultivation of hundreds of hectares of dying unproductive tree stands exposed to extreme pollution levels is senseless and immediate replacement should be considered.

14628 APTIC NO. 32332

Halbwachs, Gottfried

THE WATER BALANCE IN FOREST TREES DAMAGED BY POLLUTION. *(Untersuchungen ueber den Wasserhaushalt Rauchgeschaedigter Forstgehoelze). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 209-218. 5 refs. (Sept. 9-14.)*

Regardless of the effect of the site, steadily increasing continuous sap pressure is operative from the stem upward to the tip of the crown in undamaged spruce, pine, and birch trees, while in identical damaged species a distinct decline in sap pressure can be observed in the apical region of the trees. This decline in sap pressure is not necessarily a function of the insertion height of the branch under examination, but rather of the degree of damage to needles or leaves. Red pines in particular showed a close correlation between sap pressure decline and the extent of damage decaying needles. This phenomenon can probably be explained physiologically by the destruction of a comparatively small number of apical needles with the highest osmotic pressure, causing a decline in sap pressure.

14629 APTIC NO. 32283

Heggestad, H. E. and E. F. Darley

PLANTS AS INDICATORS OF THE AIR POLLUTANTS OZONE AND PAN. *Council of Europe, Committee of Experts on Air Pollution, Air Pollution Proc. First European Congr. Influence Air Pollution Plants Animals, Wageningen, Netherlands, 1968, p. 329-335. 11 refs. (April 22-27.)*

Plants are useful indicators of the presence of photochemical air pollutants. Young pinto bean plants are suggested to determine the possible presence of ozone and peroxyacetyl nitrate. Ozone causes a small fleck or dark stipple on the upper surface of mature, fully expanded leaves, while PAN causes silvering, glazing, or metallic sheen on the lower surface. To indicate the presence and obtain some information on the level of ozone, the tobacco varieties Bel-B (resistant), Bel-C (sensitive), and Bel-W3 (supersensitive) are suggested. Other plants sensitive to ozone are spinach, radish, tomato, a white-flowered variety of petunia, and white pine. A synergistic action by ozone and sulfur dioxide has been discovered. It is possible for plant injury to develop when these pollutants are present at concentrations too low to produce injury as an individual pollutant. The injury in tobacco resembles that caused by ozone. Therefore, in areas where SO2 is present, the level of ozone required to cause injury will be reduced.

14630 APTIC NO. 32328

Holobrady, K. and J. Toth

THE EFFECT OF PARTICULATE EMISSIONS FROM CEMENT PLANTS ON VEGETATION. *(Beitrag zu den Einwirkungen von festen aus Zementfabriken emitierten Partikeln auf die Vegetation). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 139-161. 48 refs. (Sept. 9-14.)*

The effect of particulate emissions from cement plants was studied in model experiments performed on sugar beet plants grown in glass houses and on field cultures of sugar beet growing in the vicinity of the Stupava cement plant in Slovakia. Ninety percent of the particles emitted were smaller than 10 microns in diameter and contained predominantly calcium oxide, silicon dioxide, and aluminum oxide. The eluate was strongly alkaline. Dust deposits in the glasshouse experiments had a negative effect on organic carbon increase in sugar beet leaves and caused an increase in leaf temperature and a reduction in the size of chloroplasts. The same tests performed on field-grown sugar beet did not bear out these results, perhaps because the dust cover is washed off by rain periodically and carried off by wind, and is generally more variable than the dust cover achieved in greenhouse experiments. Thus agriculatural crops exposed to particulate emissions from cement plants do not incur appreciable damage, although such damage cannot be excluded completely.

14631 APTIC NO. 32336

Ilmurzynski, E.

ATTEMPT OF THE INTRODUCTION OF CERTAIN NORTH AMERICAN TREE SPECIES TO FOREST PLANTATIONS IN INDUSTRIAL REGIONS. *Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 415-425. (Sept. 9-14.)*

Cultures (0.28 ha in size) of white pine, red oak, Douglas fir, northern white cedar, and eastern hemlock of North American origin were planted experimentally in many localities of Poland including the Upper Silesian, Dabrowa, and Krakow industrial basins to study the effect of various biotic and abiotic environmental factors, including air pollution, pest infestation, and fungus diseases. Results obtained over a four-year observation period were encouraging with respect to the possibility of using some American tree species to replace susceptible domestic species which cannot withstand the effects of pollution in industrial areas. The relatively good health of white pine stands surrounded by dying domestic Scots pine trees was a case in point. Insect infestation was lower than in domestic species and the rapid healing of wounds caused by the Hylobius beetle demonstrated the superior regenerative power of the white cedar. Results obtained previously with the western red cedar and the western hemlock were also promising.

14632 APTIC NO. 31921

Janczewski, Henryk

INFLUENCE OF NATURAL GAS ON VEGETATION, ESPECIALLY TREES. *(Wplyw gazu ziemnego na roslinnosc a zwlaszcza drzewa). Text in Polish. Gaz Woda Tech. Sanit. (Warsaw), 45(4):118-121, 1971.*

Penetration of natural gas into the soil, which in some instances is estimated to be as high as 40 l/hr, lowers the terrestrial oxygen concentration, increases the carbon dioxide concentration, and causes the drying out and death of trees. Of 128,000 trees in various regions of Holland, about 2540 trees died in 1967 as a result of exposure to gas in the soil. In another analysis of 1736 Netherland trees, 22% perished because of gas exposure, 34% died of unknown causes, and another 24% perished as a result of storms, hurricanes, and infections. The percentage mortality of trees was not significantly correlated with age, although the somewhat higher death rate of trees of advanced years was probably related to their location in older areas of cities where the gas conducting networks generally have more leakage. No relationship was observed between seasonal factors and tree mortality, and none of the species was more susceptible to the toxic effects. However, other factors contributing to tree mortality included an increase in vehicular traffic, underground construction, or construction of high buildings, trains, paving of streets, climatic effects and changes in the soil water content. Because of natural gases greater pressure in the conducting pipes and low moisture content, it is deleterious for conducting pipes than manufactured gas, since it has a tendency to dessicate and distort the connections between pipes which are sealed with lead and hemp rope. Natural gas showed about 20 leakages/km of conducting pipe, compared to six such leakages for manufactured gas. Three methods of removing gas from the soil by either compression, drainage, or ventilatory openings are briefly evaluated.

14633 APTIC NO. 32344

Jung, Erwin

CHANGES IN AFFORESTATION OF THE POLLUTED REGION OF RAUSHOFEN. *(Bestandesumwandlungen im Rauchschadensgebiete von Ranshofen). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zaniecszyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 407-413. (Sept. 9-14.)*

An aluminum plant in Raushofen is the source of fluorine and tar containing emissions polluting 800 ha of an almost entirely wooded countryside of spruce and white pine with some fir and beech trees. Of this area 120 ha were either completely destroyed by pollution or so heavily damaged that reforestation with more resistant species became necessary. Sixty ha were planted with birches and alders 5 to 6 m high; while they are not a crop-yielding culture they form, because of their high resistance to heavy concentrations of pollutants, and excellent protective belt around the aluminum plant. Only in the close vicinity of the ovens did the alder not take hold. There, sallow (Salix caprea) was planted which, while only 1.5 to 2 m high, does contain the heaviest pollution emitted from the ovens. The alder belt is about 600 m deep. The remaining 60 ha furthest from the plant were replanted with larch trees. Two ha were planted experimentally with fir. Parcels of the remaining woods were classified according to a five-point scale with the fifth point denoting the highest degree of pollution damage. Reforestation is ordered when a parcel incurs 40% damage (2.5 on the point scale).

14634 APTIC NO. 32330

Kaleta, Milan

VEGETATIVE CONDITIONS IN THE DISPERSION AREA OF MAGNESITE EXHALATION PRODUCTS NEAR JELSAVA. *(Vegetationsverhaeltnisse im Wirkungsgebiet der Magnesitexhalationsprodukte bei Jelsava). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 173-183. 15 refs. (Sept. 9-14.)*

The effect on vegetation of emissions from the roasting and processing of magnesite ore was studied by determining the abundance, dominance, and sociability of plant species on 16-sq m plots at various distances from the source. The fly ash contains 80% magnesium in the form of oxide and numerous other elements. MgO turns to magnesium hydroxide upon contact with water and encrusts the soil with a crust up to 15 cm thick, causing a marked reduction in the number of species growing in the magnesite fly ash dispersion area. The number of plant species decreases with decreasing distance from the source. The emissions have a selective effect on the structure of plant communities by eliminating sensitive species and by replacing them with resistant types. This selection operates mainly through the soil and only to a small degree through assimilation organs. Plant succession is characterized by the species Elytrigia repens, Puccinellia distans, Chenopodium glaucum, Carex hirta, and Carex distans. In the zone of undamaged higher plants, a decrease of bacteria participating in cellulose decomposition occurs.

14635 APTIC NO. 32050

Kelley, John J. and Phillip L. Johnson

OBSERVATIONS OF CARBON DIOXIDE AND PLANT GROWTH IN AN ARCTIC ECOSYSTEM. (FINAL REPORT). *Washington Univ., Seattle, Dept. of Atmospheric Sciences, and Army Cold Regions Research and Engineering Lab., Hanover, N. H., ONR Contract N00014-67-A-0103- 0007, Proj. NR 307-242, Rept. 8, 120p., Oct. 1970. 9 refs.*

NTIS, DDC: AD 715789

Results are presented of the analyses of atmospheric carbon dioxide and ecological factors at Meade iver Camp and at North Meadow Lake (Barrow), Alaska. Reference gas calibrations used in the CO2 program are summarized, and the methods used to obtain the data for CO2 concentrations at both stations are discussed. Variations of CO2 in the air, at ground level, and at 16 m above the ground are given for both the Meade River Station and North Meadow Lake. Meteorological observations are presented for the period of observations. The rate of growth percentage of five species of tundra plants is shown, and the correlation between CO2 concentration in the atmosphere and the amount at ground level is given. Data for the amounts of chlorophyll and dry weight production in each of four types of communities are presented. A list of publications resulting from the interpretation of these data is included. (Author abstract)

14636 APTIC NO. 32343

Kisser, Josef

THE PHYSIOLOGIC EFFECT OF POLLUTION ON VEGETATION. *(Physiologische Probleme der Einwirkung von Luftverunreinigungen auf die Vegetation). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 27-43. 18 refs. (Sept. 9-14.)*

The observations that individual plants in a monoculture react differently to air pollution, that gladioli strains differ in their resistance to pollutants, and that resistance of a plant to hydrofluoric acid does not coincide with its resistance to sulfur dioxide lead to the conclusion that generally there are no pollution resistant plants or strains but only increased resistance to a certain chemical compound. The major part of damage to vegetation can be attributed to gaseous components of smoke emissions which penetrate into leaf tissues by gas diffusion. The degree of damage to leaf cells depends basically on the quantity of gas that penetrates into the leaf tissues and on peak concentrations, if the leaf pores are open during the emission period. Exposure of plants to hydrochloric acid caused a depression of the water balance while exposure to SO2 caused an initial rise, indicating that the effect on the pore opening mechanism can differ from gas to gas. Higher osmotic pressures and greater diffusion in peripheral regions and leaf tips were found in all plants examined, where leaf damage is initially manifested. In some cases the distribution of leaf damage is also determined by leaf veins.

14637 APTIC NO. 32340

Knabe, Wilhelm

EXPERIMENTAL TESTING OF FLUORINE ACCUMULATION IN NEEDLES AND LEAVES OF PLANTS IN RELATION TO THEIR EXPOSURE HEIGHT ABOVE GROUND. *(Experimentelle Pruefung der Fluoran-*

reicherung in Nadeln und Blaettern von Pflanzen in Abhaengigkeit von deren Expositionshoehe ueber Grund). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 101-116. 6 refs. (Sept. 9-14.)

At a distance of 4.6 km from an aluminum plant emitting 30 kg F/h (80% in gaseous, 20% in dust form), fluorine emission and accumulation were measured in potted plants, including pine, spruce and poplar saplings, lupines, grasses, and cereals placed 0, 4.3, 8.3, and 12.3 m above ground. The differences in fluorine content determined by the Duncan test between various levels were found to be significant in some instances with the fluorine levels increasing in all instances from the ground level upward. The increase was largest from the zero to the 4.3 m level. A steady increase in fluorine content over the entire height was found only in two-year old pine needles; in the other plants the fluorine accumulation curve flattened out with increasing height. If the fluorine content at ground level is taken to be 100%, then following a 20-day exposure at the 12.3 m above-ground level grass reached a maximum of 178%, lupines 173%, mustard 194%, barley 205% and pine needles after a 116-day exposure between 271 and 360% depending on clone and age of needles. The absolute fluorine content difference between the lowest and the highest level was 4.4 mg F/100 g dry matter in lupines and 31.8 mg F/100 g dry matter in pine needles. Differences in wind velocity at the various levels may account for the differences in fluorine levels.

14638 APTIC NO. 32324

Lampadius, F.

HISTORY OF COMBATTING SMOKE DAMAGE THROUGH FORESTRY. *(Die Geschichte einer Rauchschadenabwehr mit waldbaulichen Mitteln). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 447-450. (Sept. 9-14.)*

The use of prophylactic and therapeutic means for combatting smoke damage to forests is usually based on results of experiments under laboratory conditions, or of short-term observations in the field. Whether remedies employed on this basis of such methods will stand up to long-term emissions is unknown. Another important approach for research in smoke damage is the modification, over a period of years of the composition of forests to make them more resistant to pollution effects. Burkhardt Forest in Saxonia has an area of 200 hectares and is situated 360-580 m above sea level. In 1900, when this forest was composed of pine trees already severely damaged by smoke, a modification program was started which was continued over several decades until pine trees were almost completely eliminated. Very detailed records of this history up to the present time are available, including data on varying emission conditions over the years.

14639 APTIC NO. 32287

LeBlanc, F.

EPIPHYTES AND AIR POLLUTION. *Council of Europe, Committee of Experts on Air Pollution, Air Pollution Proc. First European Congr. Influence Air Pollution Plants Animals, Wageningen, Netherlands, 1968, p. 211-221. 8 refs. (April 22-27.)*

The sensitivity of epiphytes to atmospheric pollutants was investigated in three areas: Wawa, Ontario, where an iron sintering plant is located, Sudbury, Ontario, where three nickel smelters are located, and Montreal. In Wawa and Sudbury, the number of epiphytes as well as their coverage (percentages) was inversely proportional to the degree of pollution by sulfur dioxide. In the vicinity of the iron sintering plant, there is a large epiphyte desert, a high atmospheric SO2 concentration, and a significant increase in the acidity and sulfate concentration in surface waters, soils, and plant materials. Within a 10-km radius of the nickel smelters, no epiphytes occur because all trees have been destroyed. Beyond this area trees exist but are widely dispersed. In Montreal, a direct relationship exists between the quality of the epiphytic vegetation and the location of heavy industries and residential centers. The percentage of frequency of epiphytes increases with distance from the city. The absence of highly toxiphobus epiphytic species may have use as an indicator of SO2 pollution.

14640 APTIC NO. 31836

Leone, Ida A. and Eileen Brennan

MODIFICATION OF SULFUR DIOXIDE INJURY TO TOBACCO AND TOMATO BY VARYING NITROGEN AND SULFUR NUTRITION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1971. 16 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-64.)*

Tobacco and tomato plants grown in a sand-solution culture with varying levels of nitrogen or sulfur were exposed to injurious levels of sulfur dioxide. Plants of both species which were deficient in either nutrient exhibited decreased susceptibility to the gases compared with plants grown at optimal levels of each nutrient. Foliage of these plants also had increased stomatal resistance, as measured by a porometer, and decreased total sulfur accumulations. Plants grown at optimum levels of each nutrient showed increased susceptibility over that of the deficient plants. Stomatal resistance was lower and sulfur accumulation was greater than in the deficient plants. Over-abundant nitrogen appeared to decrease susceptibility whereas over-supplies of sulfur increased it. The response of plants with deficient or optimal supplies of either nutrient might be explained by the effects of nutrition on stomatal activity and hence on ability to absorb sulfur dioxide-sulfur from the atmosphere; mineral deficiency is known to increase stomatal resistance, and mineral sufficiency, to decrease resistance by viture of increased efficiency of water use. The difference in response between plants overfertilized with nitrogen or sulfur is explained by the fact that sulfur is both a nutrient and phytotoxicant. Increased carbohydrate accumulation in the nitrogen-deficient and sulfur-deficient plants might play an additional role in protection from SO2-injury. (Author abstract modified)

14641 APTIC NO. 32341

Lux, Herbert

THE COMBINED EFFECT ON BASIC DUSTS AND OF SULFUR DIOXIDE ON PINE TREES AND THE FORMATION OF HUMUS FORMS. *(Studien ueber die kombinierten Einfluesse von basischen Staeuben und Schwefeldioxid auf Kiefern und die Ausbildung von Humusformen). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 79-94. 22 refs. (Sept. 9-14.)*

The combined effects of kiln dust and SO2 emitted from a cement plant in Ruedersdorf, near Berlin, on a six-year old pine tree stand two km from the plant and the combined effects of fly ash and SO2 from the Zschornewitz power plant on pine trees one km away, were investigated. Damage to pine needles was assessed using a five-color shade scale from green to completely brown. Pine saplings were not damaged by a thick cement kiln dust cover or the concomittant increase in soil pH to seven and eight. Needle necrosis was caused solely by SO2 (median long-term level not exceeding 0.20 mg/cu m). The higher soil pH did not increase susceptibility of the needles to damage from SO2. The dust-covered needles had a healthy green color. In contrast, fly ash and SO2 from the power plant caused widespread necrosis of pine needles. This is attributed to the combined effect of the deactivation by high SO2 levels of enzymes responsible for the decomposition of the humus and the calcification of the soil by fly ash. In general particulate emissions alone are not responsible for substantial damage to vegetation except where dust contains phytotoxic components like chloride, sulfite, and arsenic.

14642 APTIC NO. 32454

Manning, William J.

EFFECTS OF LIMESTONE DUST ON LEAF CONDITION, FOLIAR DISEASE INCIDENCE, AND LEAF SURFACE MICROFLORA OF NATIVE PLANTS. *Environ. Pollut., 2(1):69-76, July 1971. 15 refs.*

The effects of continuous emissions of limestone dust from quarries and processing plants on leaf condition, foliar disease incidence, and leaf surface microflora of native wild grapes, sassafras, and hemlock in a mountain valley in southwestern Virginia were investigated. Grape and sassafras leaves with moderate dust deposits had more fungal leaf spots than comparable leaves with visible dust deposits. Dusty grape and sassafras leaves were darker green in color than leaves with dust deposits, but all were comparable in size. The terminal new growth of hemlocks with heavy dust deposits was greatly reduced in length when compared to terminal growth on hemlock trees without visible dust deposits. Second year needles of dusty hemlocks were frequently chlorotic. Dusty grape and sassafras leaves had greatly increased numbers, but not kinds of bacteria and fungi when compared to clean leaves. Bacteria were greatly reduced in number on dusty hemlock leaves, while fungi were increased. Streptomyces spp. were few in number and were isolated almost exclusively from dusty leaves. Streptomyces spp. were absent, and bacteria and fungi were drastically reduced in kind and number on grape leaves heavily encrusted with dust. (Author abstract)

14643 APTIC NO. 32164

McGrath, James J. and John V. Moffa

A SYSTEM TO EVALUATE THE INFLUENCE OF CHRONIC EXPOSURE TO CO ON THE HATCHING EGGS OF THE WHITE LEGHORN CHICKEN. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 12p., 1971. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-27.)*

A system was designed to hatch chicks in an environment containing small concentrations of carbon monoxide. A wooden incubator placed in a plexiglas chamber furnishes the proper temperature and humidity range for the developing embryo. Carbon monoxide is introduced into the chamber from a tank containing one percent CO and it is diluted to the desired concentration. The concentration of the gas in the vicinity of the eggs was monitored continuously. Eggs were incubated in concentrations of 100 ppm CO for eight hours a day. Control eggs had a hatchability of 78.8%, excluding those eggs which showed no obvious embryological development and were considered sterile. Eggs incubated in 100 ppm CO showed a hatchability of 61.7%, and those chicks dead-in-shell showed a trend in mortality toward a more early embryonic death. Chicks which did hatch exhibited a poorer yolk absorption. Other parameters which were recorded for the hatched chicks (birth weight, hematocrit, hemoglobin percentage, and ventricular weight) did not differ markedly from controls. This lack of response may be due to the resistance of young animals and prenatals to hypoxic stress. One group of eggs was incubated at 200 ppm CO and the embryos examined prior to hatching. Only four of the 30 incubated were alive at the time of opening, suggesting that the hatchability would have been only 13.3%. Many eggs dead-in-shell showed symptoms similar to acute CO intoxication. Further investigations on the effects of chronic sub-lethal CO concentrations are suggested. (Author abstract modified)

14644 APTIC NO. 32281

Mudd, J. B.

BIOCHEMICAL EFFECTS OF PEROXYACETYL NITRATE AND OZONE. *Council of Europe, Committee of Experts on Air Pollution, Air Pollution Proc. First European Congr. Influence Air Pollution Plants Animals, Wageningen, Netherlands, 1968, p. 161-166. 11 refs. (April 22-27.)*

The difference in the chemical activity of two plant-damaging pollutants, ozone and peroxyacetyl nitrate, with a relatively well defined group of proteins and amino acids was studied. The main reaction of PAN with proteins is with the sulfhydryl group of the cysteine residue. Disulfide bonds are relatively unaffected. There is some oxidation of methionine to methionine sulfoxide, but all other amino acids are resistant. Oxidation of amino acids by ozone is much less specific. Cysteine, methionine, tryptophan, histidine, tyrosine, phenylalanine, and cystine are all oxidized. Consequently, some enzymes such as ribonuclease are resistant to PAN, but susceptible to inactivation of ozone. (Author abstract modified)

14645 APTIC NO. 32331

Paluch, Jan

THE APPLICATION OF PLANT TESTS IN THE ASSESSMENT OF THE DEGREE OF AIR POLLUTION. *(Die Moeglichkeiten der Anwendung von Pflanzentesten zur Beurteilung des Luftverunreinigungsgrades). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 219-234. 5 refs. (Sept. 9-14.)*

Tests of germination and root formation during the initial developmental stage of plants were used to assess the degree of noxiousness of precipitation which in turn reflects the degree of air pollution. The germination power of seed grains of Pisum sativum, Brassica oleracea, Papaver somniferum, and Zea mays was tested (percentage of germinating seed kernels, of burst, and of swollen kernels) and their root lengths measured. Studied was the effect of spring and of summer precipitation at Gliwice, Zabrze, Chorzow, Sosnoviec and Katowice in the Upper Silesian industrial basin. The tests were performed in sand-filled earthenware planters placed on Petri dishes filled with the precipitation samples. Twenty grains were planted in each planter and measured eight days later. Comparative tests were made with precipitation from other, relatively low-pollution areas. The precipitation from Chorzow (with the highest evaporation residue) inhibited the development of roots and germinating seeds by 50% in pea, poppy, and maize seeds and by 15% in oat and clover seeds. Some of the samples had a growth-promoting effect which is still unexplained. Plant tests are potentially useful as indicators of maximal permissible levels of pollutants, but further research is needed.

14646 APTIC NO. 32338

Paluch, Jan and Stanislaw Karweta

ACCUMULATION OF ZINC AND OF LEAD IN THE SOIL AND IN PLANTS. *(Die Akkumulierung von Zink und Blei im Boden und in Pflanzen). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 127-138. 4 refs. (Sept. 9-14.)*

The accumulation of zinc and of lead in soil and plants was studied in a rural wooded area of Poland following the construction of a zinc, lead, and cadmium ore processing plant. Before establishment of the plant, the soil of the area contained between 15 and 1600 mg Zn/kg and between 40 and 3600 mg Pb/kg, indicating lead and zinc-bearing outcroppings among the samples collected at 22 randomly selected points. Absorbable zinc and lead compounds fluctuated between trace quantities and 31.30 mg Pb/kg and 22.43 mg Zn/kg, depending on soil acidity. In alkaline soils these amounts were almost zero. Following operation of the plant for a year (and consequent dust emission) the Pb and Zn soil content increased noticeably, especially in soils with initially low Zn and Pb levels where the increase amounted to several hundred percent. Generally Pb and Zn content in conifers in the polluted area increased, with the Zn level increasing more than the Pb. A clear cut correlation was found between available soil Pb content and assimilation by plants; the correlation was less obvious for Zn. Both Zn and Pb levels in plants manifested great differences during the vegetation period. Zn content in pine needles increased steadily over a three-year observation period while no difference in the Pb content was found in two and three- year old needles. Although no deleterious effects were noted in annual or in perennial plants, these are expected to occur eventually.

14647 APTIC NO. 31801

Purves, D. and E. Jean MacKenzie

TRACE-ELEMENT CONTAMINATION OF PARKLANDS IN URBAN AREAS. *J. Soil Sci., 20(2):288-290, 1969. 14 refs.*

Evidence is presented that soils in urban parklands are markedly contaminated with copper, boron, lead, and zinc. Zinc dibenzyl dithiocarbamate was used as the reagent for determining EDTA extractable copper in soils, while copper in herbage was determined by a spectrographic plant-ash method. Porous-cup spark excitation using boron-free graphite electrodes was used for the analysis of herbage and water extracts of soils with respect to B. Zinc in herbage and acetic acid extracts of soil was determined by atomic absorption spectrophotometry. Herbage from the same urban parklands contained significantly higher levels of Pb and Zn than herbage from permanent pastures in rural areas. (Author summary modified)

14648 APTIC NO. 32280

Raay, A. van

THE USE OF INDICATOR PLANTS TO ESTIMATE AIR POLLUTION BY SO2 AND HF. *Council of Europe, Committee of Experts on Air Pollution, Air Pollution Proc. First European Congr. Influence Air Pollution Plants Animals, Wageningen, Netherlands, 1968, p. 319-328. (April 22-27.)*

Indicator plants can be used to estimate damage to crops by air pollution, although they can never give an absolute measure. An indicator plant must be sensitive to a certain contaminant, and it must react with clearly visible specific symptoms, preferably at low concentrations. Sulfur dioxide and hydrogen fluoride pollution may be detected with plants that accumulate the contaminant or with simple measuring devices. Both symptoms and chemical analysis must be used to trace the source, the rate, and the extent of contamination. Indicator plants with a different reaction to SO2 and HF allow distinction in areas where both pollutants occur. Endive, lucerne, clover, buckwheat, and barley may be used to detect SO2, and gladioli and freesias for HF. By using these plants in many small plots it is possible to mark the polluted area. The advantages of this method are low cost and immediate and easy indication of the pollution. The disadvantages are the possible non-specificity of symptoms and losses of the pollutant from the plant. Gladioli are being studied for a possible correlation between the fluorine content of leaves, or tipburn injury, and the fluorine concentration of exposed sticky papers. (Author abstract modified)

14649 APTIC NO. 32286

Robak, H.

ALUMINIUM PLANTS AND CONIFERS IN NORWAY. *Council of Europe, Committee of Experts on Air Pollution, Air Pollution Proc. First European Congr. Influence Air Pollution Plants Animals, Wageningen, Netherlands, 1968, p. 27-31. (April 22-27.)*

Quantities of fluorine emitted from aluminum plants polluting the air in Norway vary from 8-10 to 27-30 kg/hr. Natural pine forests in the neighborhood of all plants are notably damaged, in three cases even completely destroyed. Visible injury is observable at up to 32 km. The current year s needles of badly damaged trees usually show a fluorine content above 40 ppm. Damage to spruce forests has occurred in a 100-200 ha area within which the fluorine content of the current year s needles exceeds 15-20 ppm and that of the last year s needles 24-35 ppm. Because the outlook for preventing fluorine-induced conifer damage by technical means does not appear promising, a switch should be made to more resistant conifer species. Field observations and experimental plot studies show that Larix decidua and L. leptolepis are remarkably free from damage, even under unfavorable weather conditions.

14650 APTIC NO. 32342

Schnaider, Zbigniew and Zbigniew Sierpinski

FOREST CONSERVATION PROBLEMS IN THE UPPER SILESIAN INDUSTRIAL REGION. *(Probleme des Forstschutzes im Oberschlesischen Industriebezirk). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 45-62. 11 refs. (Sept. 9-14.)*

Sulfur dioxide and dust levels in 1967 in woods of the Upper Silesian industrial region were measured at 0.9-1.318, 0.466-1.380, and 0.372 mg SO2/100 sq cm at distances of 1, 2.5-3, and 6 km respectively from the emission source, and 0.553-0.667, 0.311-0.824, and 0.290 g dust/sq m respectively from the same distances. These levels of pollution caused a general decrease of productivity of the forests and a degradation of tree stands during the past decade, including pest infestation. The greater part of these forests are in such condition that their continued cultivation is senseless regardless of age and a replacement of these stands by hardier and more resistant species and strains like Quercus borealis, Robinia pseudoacacia, Platanus, Thuja, Tsuja, Tsuga canadensis, Pinus nigra and Larix leptolepis is recommended. Because of the close connection between pollution and susceptibility to pest infestation, not only resistance to chemical pollutants but also to potential pest infestation should be considered when making a choice of tree varieties as a replacement for the current susceptible species.

14651 APTIC NO. 32335

Schoenbeck, Helfried

THE APPLICATION OF THE TEST PLANT METHOD. A MODIFICATION OF SAURER S PLANT INDICATOR METHOD FOR THE DETECTION OF PLANT DAMAGING IMMISSIONS. *(Die Anwendung der Testpflanzenmethode. Eine Modifikation des Saurerschen Fangpflanzenverfahrens zum Nachweis von Pflanzenschaedigenden Immissionen). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 313-325. 9 refs. (Sept. 9-14.)*

Proof that damage to vegetation by emissions from a zinc smelter was obtained by cultivating identical plants at various distances downwind from the smelter and in an uncontaminated locality. To eliminate differences in soil and other environmental factors holes were made in the ground, lined with plastic to prevent interaction with the surrounding soil, and filled with loamy sand containing 20 mg Zn/100 g soil plus 11.4 mg Pb/100 g soil (contaminated soil) and 4.0 mg Zn/100 g soil plus 5 mg Pb/100 g soil (normal soil). Both soil types were used side by side in all experimental sites. Summer wheat, beans, oats, and sugar beet were used as experimental plants. Since damage to the control area plants was due only to the contaminated soil, any additional damage in a polluted atmosphere could be ascribed to the effect of atmospheric pollutants. Wheat grain yield at various distances from the smelter was 46-77% lower than the yield in the control area. Other cultures suffered comparably. Generally the damaging effect of air pollution on plant growth was smaller than that of the metal salt pollutants in the soil. The Zn, Pb, and S levels in plant tissues decreased with increasing distance from the zinc smelter.

14652 APTIC NO. 32224

Schucht, F., H. H. Baetge, and M. Dueker

SOIL ANALYSES IN THE SMOKE DAMAGED AREA OF THE METALLURGICAL PLANT OKER IN UNTERHARZ. *(Ueber bodenkundliche Aufnahmen im Rauchschadengebiet der Unterharzer Huettenwerke Oker). Text in German. Landwirt. Jahrb., vol. 76:51-98, 1932. 39 refs.*

The metallurgical plants in Oker primarily emit sulfur dioxide, nitrous acid, and carbon dioxide. The effect of these emissions on the soil was determined by taking soil samples, profile samples, and individual samples at 42 points. The area has primarily clay soil interspersed with sand and gravel. The soil was studied to determine the absorption, permeability, and coherence. Hydrochloric acid extracts were analyzed to determine if changes had occurred because of the pollutants. With prevailing west winds, an extensive area receives the emissions from the metallurgical plants. In all samples, an enrichment of the sulfates (in the form of calcium sulfate) was found. This cannot cause soil damage since the quantities are too small. With the influence of SO2 and CO2, the soil loses its alkalinity. However, the soil contained so much calcium the SO2 became bound. Iron sulfates, which form only without alkalinity, could not be determined. Within a belt of one to one and one half km wide, hardly anything grew. This belt was followed by a zone (2 km from the emission source) where the root crops were still heavily damaged. Between three and three and one half km from the emission source, the effect of the pollutants was weak. Also the metals copper, lead, zinc, and arsenic were found in the soil; they are mostly insoluble, and thus are harmless compounds.

14653 APTIC NO. 32183

Skye, Eric

EFFECTS OF SULFUR DIOXIDE ON PLANTS AND ANIMALS. *In: Recommendations Relating to Norms for Sulfur Dioxide Content in Open Air. (Rekommendationer rorande riktvarden for svaveldioxidhalt i utomhusluft). Swedish Government Air Pollution Board, Stockholm, Communication 6601, 1965 (?). Translated from Swedish by Scientific Translation Service, Inc., Santa Barbara, Calif., p. 10-14, 1967.*

The first plant organisms damaged by sulfur dioxide are the lichens on tree trunks. Herbs, grasses, and woody plants often show typical damage at concentrations as low as 30 ppm. Coniferous trees are attacked at the tips of the needles, damage then spreading toward the needle base. The parts attacked turn red or whitish in color. Grasses and liliaceous plants show brown spots at the tips of the leaves. Grass blades become limp and are streaked with brown. When severely attacked, trees, shrubs, and herbs show damage to the leaf surface between the veins. The site attacked turns yellow, brown, or red and the tissues dry rapidly. In animals, the respiratory tract is usually affected. The reaction of insects such as bees and butterflies is not known.

14654 APTIC NO. 32282

Spierings, F. H. F. G.

A SPECIAL TYPE OF LEAF INJURY CAUSED BY HYDROGEN FLUORIDE FUMIGATION OF NARCISSUS AND NERINE. *Council of Europe, Committee of Experts on Air Pollution, Air Pollution Proc. First European Congr. Influence Air Pollution Plants Animals, Wageningen, Netherlands, 1968, p. 87-89. (April 22-27.)*

The studies of injuries to monocotyledonous ornamental flowers growing near a steel factory west of Amsterdam, gladioli and tulips artificially fumigated with hydrogen fluoride showed the same order of sensitivity as in the field. Tests in a fumigation chamber with different concentrations of HF resulted in the following order of decreasing sensitivity: Ixia, Freesia, Crocus, Sparaxis, Fritillaria, Chionodoxa, Scilla, Muscari, and Galanthus. The symptoms of injury were an ivory-colored necrosis of leaf tips, or, in freesias, a marginal ivory-colored necrosis. Narcissus and Nerine bowdenii showed different symptoms; after the appearance of the ivroy-colored leaf tip, the injured part of the leaf slowly extended and a yellow discoloration started close to the original necrosis. This area may stretch several times further than the injured tip. (Author abstract modified)

14655 APTIC NO. 32291

Stamatovic, S. and D. Milic

PROBLEMS OF AIR POLLUTION IN YUGOSLAVIA. *Council of Europe, Committee of Experts on Air Pollution, Air Pollution Proc. First European Congr. Influence Air Pollution Plants Animals, Wageningen, Netherlands, 1968, p. 255-258. (April 22-27.)*

The expansion of the nitrogen and phosphate fertilizer industries in Yugoslavia has caused an increase in fluor emissions, endangering plants and domestic animals. In affected areas, fluorosis has been observed in horses, cattle, sheep, and goats. Its occurrence is explained by the quantities of fluor measured in hay, straw, wheat, maize, and sunflower seeds. The intensity of the poisoning varies according to geographic location, climate, and animal species. Under normal conditions, damages are restricted to a distance of about 5 km from the factories. A lead foundry has created the problem of lead accumulation in soil, water, and animals, particularly in ruminants. Lead poisoning has been observed in lambs but so far not in sheep. Sheep milk in the affected area contains an average of 132 gamma/100 g lead. About the same concentration is found in milk from cows, though no lead poisoning has been observed in cattle.

14656 APTIC NO. 32346

Stefan, Klaus

THE NATURAL SULFUR CONTENT OF PINE NEEDLES AND ITS SIGNIFICANCE FOR POLLUTION DAMAGE ASSESSMENT. *(Ueber den natuerlichen Schwefelgehalt von Fichtennadeln und seine Bedeutung fuer die Rauchschadensdiagnose). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 297-312. 13 refs. (Sept. 9-14.)*

Sulfur content and its fluctuations were determined in one-, two-, and three-year old pine needles from five different localities. The sulfur level of all needles tested varied between 0.033 and 0.079% S/dry matter and hardly changed over a period of several consecutive years; differences between median yearly levels of needles from the same locality were not statistically significant. The yearly fluctuation in the S content of individual trees was plus or minus 0.02% S/dry matter, that between different trees was 0.036% S/dry matter. There were significant differences in the sulfur content of pine needles from the five localities being studied, attributable to environmental differences and different characteristics of individual trees. Two-year old needles had an 0.11% natural sulfur content, threeeyear old needles a 0.13% content in dry matter. The yearly fluctuation of the sulfur content of these needles was plus or minus 0.02% S. Indication of SO2 emissions into the atmosphere can be derived from increases in the sulfur content of needles above their natural levels or from increased annual fluctuation rates.

14657 APTIC NO. 32329

Steinhuebel, Gejza

THE DYNAMICS OF RESISTANCE AND THE DECLINE IN NUTRIENT SUPPLY OF GROWING SHOOTS RESULTING FROM A DUST COVER OF EVERGREENS. *(Zur Dynamik der Resistenz und einer Herabsetzung der Versorgungsmoeglichkeiten der wachsenden Triebe infolge Bestaubung bei Immergruenen). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 163-171. (Sept. 9-14.)*

The relationship between vitality and resistance to emissions was studied on evergreens by covering laurel plant leaves with artificially applied dust from non-toxic particulates emitted by the blast furnaces of Ostrava in Czechoslovakia, to determine the difference in the degree of exhaustion of leaves (loss of dry weight) by age and season and the degree to which the dust cover exacerbated exhaustion. The dry weight of dust-covered and dust- free halves of the same leaf with identical light exposure were compared. During the vegetation period laurel leaves lost weight in the course of the day, indicating that dissimilation and transport to shoots or buds exceeded the gain from photosynthesis. The highest dry weight losses were recorded on the oldest leaves. This condition persisted until the complete maturation of the fruit. Dust cover intensified leaf exhaustion by 25% to more than 100%. Higher temperature had a similar effect.

14658 APTIC NO. 32288

Syratt, W. J. and P. J. Wanstall

THE EFFECT OF SULPHUR DIOXIDE ON EPIPHYTIC BRYOPHYTES. *Council of Europe, Committee of Experts on Air Pollution, Air Pollution Proc. First European Congr. Influence Air Pollution Plants Animals, Wageningen, Netherlands, 1968, p. 79-85. 11 refs. (April 22-27.)*

Ten ppm sulfur dioxide produced severe chlorophyl degradation in three species of epiphytic bryophytes: Dicranoweisia cirrata, Metzgeria furcata, and Hypnum cupressiforme var. filiforme. At 5 ppm, the degradation was greater in Hypnum than either Dicranoweisia or Metzgeria. Damage to chlorophyl also showed dependence on the humidity at which SO2 was supplied: the higher the humidity, the greater the breakdown. This, and the fact that phaeophytin a is the characteristic breakdown product of chlorophyl a under acid conditions, suggest that SO2 acts as sulfurous acid. The effect of 5 ppm SO2 at 100% humidity on respiration rate and sulfate accumulation was also studied. Dicranoweisia, in contrast to the other bryophytes, was capable of converting SO3(2-) to SO4(2-) with relatively high efficiencies. This ability, and the markedly higher chlorophyl a content in Dicranoweisia, may enable the moss to withstand higher pollution levels.

14659 APTIC NO. 32339

Szalonek, Irena

FLUORINE-INDUCED POLLUTION AND PLANT DAMAGE IN THE VICINITY OF A METAL ENAMELING PLANT. *(Die durch Fluor hervorgerufene Luftverunreinigung und die Pflanzenbeschaedigung in der Naehe eines Emaillierwerkes). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 117-125. 4 refs. (Sept. 9-14.)*

Fluorine-induced damage observed on fruit trees and garden plants at distances of 200-500 m from a metal enameling plant initiated measurements of fluorine emission at 0.5 and 2.5-3 m above ground and of fluorine content in plant life. The tests were performed by exposing filter paper saturated with calcium hydroxide to the atmosphere for 3.5 and 10 hours and for 30 days respectively from October 1967 to February 1968. Leaves were completely destroyed on 10-year old five-m high fruit trees, and of peripheral leaf necrosis and light grey to brown spots occurred on ornamental plants and Phaseolus vulgaris. The median monthly atmospheric fluorine level in the area of greatest damage (200 m from source) was 2.649 mg F/100 sq m with a maximum of 3.029 mg F/100 sq m at 2.5 m above ground and 2.004 mg F/100 sq m at 0.5 m above ground. The pollution level at 2.5 m above ground was everywhere greater than at 0.5 m above ground. The fluorine content in leaves of bean plants at 1.5 to 2 m above ground was 285 m from the source, two to three times that of plants growing close to the ground. Fruit trees were more susceptible to damage than horticultural and crop cultures.

14660 APTIC NO. 32325

Tesar, Vladimir and Bozena Temmlova

TREE MORTALITY OF MEDIAN-AGED PINE TREES DAMAGED BY SULFUR DIOXIDE AND POSSIBILITIES OF ITS PREDICTION FROM THE CONDITION OF THE STANDS. *(Baumarbsterben in mittelalten durch Schwefeldioxyd geschaedigten Fichtenbestaenden und Moeglichkeiten seiner Prognose nach dem bestandeszustande). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 371-388. 1 ref. (Sept. 9-14.)*

Forty- to 70-year old pine trees (2890 trees) growing in the dispersion area of SO2 emissions from the power plant at Trutnov in the foothills of the Krkonose Mountains in northeastern Bohemia were observed over a five-year period and characteristics such as tree diameter, crown length in relation to height of tree, and needle cover were measured. Results were statistically evaluated and compared with comparable data derived from pine tree stands growing in an unpolluted atmosphere. Trees with the smallest diameter die first and the percentage capable of survival is negligible; thus it is economic to remove such trees. Mortality is also high in trees with inadequately developed crowns regardless of age. Trees with a needle cover of less than 30% should be felled. Through such selective thinning of pollution exposed forests the economic damage incurred can be minimized.

14661 APTIC NO. 32333

Tollinger, V.

ASSESSMENT OF DAMAGE FROM POLLUTION ON LARGE AREAS. THE POTENTIAL DANGER OF DAMAGE TO FORESTS CAUSED BY EMISSIONS AND THE DANGER OF SUBSEQUENT SECONDARY DETERIORATION OF THE COUNTRYSIDE. *(Beitrag zur grossraeumigen Diagnose der Rauchschaeden. Die potentielle Gefahr einer Beschaedigung der Waldbestaende durch Immissionen und die Gefahr einer sekundaeren sukzessiven Zerstoerung der Landschaft). Text in German. Polska Akademia Nauk, Zaklad, Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 261-275. 8 refs. (Sept. 9-14.)*

Damage to forests in the Krusne Hory caused by pollution from the industrial and mining area of Most in northwestern Bohemia was assessed, using as criteria the actual typological composition of the forest (including conifers, deciduous, mixed forests, and special terrain vegetation), the remaining life of the tree stands, the slope of the terrain, and distance from the source of pollution plus wind direction. These criteria were valuated by a point system and the sum of the points entered into 690 mapped squares (covering 25 ha each). To assess the remaining life in a square, test communities of 60 to 80-year old pines were chosen. Completely destroyed stands (with a life of 0 to 11 years) rated 4 points, considerably damaged stands (with 12 to 23 years of life) rated three, slightly damaged stands (with 24 to 59 years of life) rated two, and undamaged stands rated one point. The potential deterioration of the countryside was assessed by the degree of difficulty of reforestration or by its impossibility. An interpretation of the resulting map scores disclosed that of the 690 squares, only 20 were not potentially endangered and that denuded areas manifested the greatest damage to the countryside.

14662 APTIC NO. 31735

Tsals, I. I.

THE DISTRIBUTION OF SELENIUM IN THE TISSUE AND ORGANS OF HENS. *Veterinariya (Moscow), vol. 46:58-61, Aug. 1969. Translated from Russian. Mundus Systems, McGregor, and Werner, Inc. Washington, D. C., 10p.*

The amount of selenium in various tissues and organs of chickens was dependent upon the quantity of selenium in their feed. When 0.1 mg of sodium selenite/kg of feed was administered to hens, their egg yield increased 9.3%. The content of selenium in the liver, ovaries, heart muscle, complex muscles, and blood cells, was also increased, while it was decreased in the kidneys.

14663 APTIC NO. 32285

Verwey, J. H. P.

INDUSTRIAL MOLYBDENOSIS IN GRAZING CATTLE PRELIMINARY COMMUNICATION. *Council of Europe, Committee of Experts on Air Pollution, Air Pollution Proc. First European Congr. Influence Air Pollution Plants Animals, Wageningen, Netherlands, 1968, p. 269-273. 6 refs. (April 22-27.)*

Near a molybdenum oxide plant, cows grazing pastures with 18 ppm copper in fresh grass (dry matter) developed symptoms of copper deficiency (diarrhea, lower milk yield, dry skin, retarded growth, depigmentation). Blood tests showed very low copper ratios (14-20 gamma/100 cc). Fresh grass contained 29-80 ppm molybdenum. All animals in which hypocuprosis was diagnosed responded almost immediately to treatment with $CuSO_4$.

14664 APTIC NO. 32322

Warteresiewicz, Maria

THE INFLUENCE OF AIR POLLUTION ON PLANTS IN THE VICINITY OF SOME ZINC WORKS. *(Einfluss der Luftverunreinigungen auf Pflanzen in der Naehe einiger Zinkhuetten). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 185-195. 12 refs. (Sept. 9-14.)*

Studies were made in 1965/66 in the vicinity of two zinc works in the Upper Silesian industrial district to determine decreases in the yield of crops, the influence of emissions on the chlorophyll content of plants, and effects on water content of plants. The gaseous emissions are sulfur dioxide and nitric oxide in substantial concentrations; dust emissions contains zinc, lead, cadmium and copper. The control points were located at varying distances between 0.4 and 2.5 km from the works, in different directions. Considerable damage to clover was found at times, with partly burned leaves which then dried and dropped off. During some periods crop yields decreased by 70% below normal in case of potatoes, 60% for clover, and 50% for beans. The chlorophyll content in damaged plants decreased. During the period of plant growth, tests were made to determine the loss of water in plants after they have been cut, by weighing the plant every hour after cutting for up to five hours. After five hours healthy bean leaves lost 43% of their weight, while damaged leaves lost 65%.

14665 APTIC NO. 31867

Wilhour, Raymond G.

THE INFLUENCE OF OZONE ON WHITE ASH (FRAXINUS AMERICANA L.). *Pennsylvania State Univ., University Park, Dept. of Plant Pathology, Thesis (Ph.D.), Dec. 1970, 86p. 48 refs.*

Scattered stippling of the upper leaf surface was the most common symptom of injury to white ash (Fraxinus americana L.) seedlings exposed to 10 and 25 ppm ozone for various time intervals; in fewer cases, stipples were confined to specific areas of the leaf. Bifacial necrosis and tissue collapse were less common symptoms. Seedlings one-year-old were sensitive to 10 pphm ozone for 0.5 hr or 25 pphm for one hr. A direct relationship was present between sensitivity and exposure time to 25 pphm ozone for exposures of one to five hr; sensitivity remained relatively constant at longer exposures up to eight hr. Seedlings treated with a high temperature before or after exposure were more sensitive than those treated at a lower temperature. In contrast, seedlings exposed to ozone at a low temperature were more sensitive than those exposed at a higher temperature. Seedlings treated with a high relative humidity before, during, or after exposure appeared to be more sensitive than those treated similarly but at a lower relative humidity. However, the difference in sensitivity was significant only when the relative humidity treatments were made prior to exposure. An additional factor, nutrient level, was also important in governing sensitivity. Fertilization significantly increased the sensitivity of three-year-old seedlings to ozone. White ash seedlings were sensitive to 25 pphm ozone during the 15-week period of the growing season examined. Sensitivity increased initially with age, but after a maximum level of sensitivity was reached it remained relatively constant for the duration of the growing season. Cotyledons, primary leaves, and secondary leaves appeared to respond to ozone in a similar manner. (Author abstract modified)

14666 APTIC NO. 32456

Williams, R. J. H., M. M. Lloyd, and G. R. Ricks

EFFECTS OF ATMOSPHERIC POLLUTION ON DECIDUOUS WOODLAND. I: SOME EFFECTS ON LEAVES OF QUERCUS PETRAEA (MATTUSCHKA) LEIBL. *Environ. Pollut., 2(1):57-68, July 1971. 29 refs.*

The levels of sulfur dioxide and particulate matter in the atmosphere around a smokeless fuel plant in South Wales have been measured in an adjacent area of deciduous woodland by the corrosion rate of zinc battery cases and from analysis of leaves of Quercus petraea. Results show there exists a marked seasonal trend in SO_2 levels in the woodland, which was not apparent in an earlier study, although there is a no marked spatial variation. In contrast, the particulate matter is a serious pollutant in the vicinity of the fuel plant and there exists a definite gradient of deposited matter on the oak leaves, decreasing with distance from the source. This surface deposit results in a significant increase in the number of stomata with particulate matter in their pores and probably affects epidermal permeability. SO_2 uptake into these leaves is probably enhanced resulting in higher levels of total sulfur. Increased sulfur presumably accumulates as free sulfate which results in more acidic conditions within the leaf that affect the degradation of chlorophyll, bringing about the early senescence of leaves in the vicinity of the fuel plant. (Author abstract)

14667 APTIC NO. 32345

Wolff, G.

THE INTERPRETATION OF MISCOLORED AERIAL PHOTOGRAPHS IN THE SERVICE OF POLLUTION DAMAGE ASSESSMENT. *(Die Interpretation falschfarbiger Luftbilder im Dienste der Rauschschadensdiagnose). Text in German. Polska Akademia Nauk, Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego, Mater. Miedzynarodowej Konf., Wplyw Zanieczyszczen Powietrza na Lasy, 6th, Katowice, Poland, 1968, p. 285-295. (Sept. 9-14.)*

A film with a superimposed panchromatic and infrared sensitive emulsion exposed simultaneously will, when developed, yield composite color effects based on the photochemical function of miscolorations, permitting the differentiation of healthy from pollution-damaged conifer crowns. The more severe the damage to pine needles and the older they are, the smaller their emission in the infrared spectrum. The explanation probably lies in anatomical structural changes or in an accumulation of necrotic substances or tissues. Another factor may be that damaged trees have fewer needles and thus expose more the the bark surface. From such spectrozonal aerial photographs on a scale of 1:5000, the condition of individual pine and spruce tree crowns can be evaluated with considerable accuracy (healthy, slightly damaged, severely damaged, dead), while on a scale of 1:10 000 such evaluation is no longer possible. A comparison of aerial and terrestrial evaluation methods yielded a 60 to 90% accuracy for the aerial photographic evaluation method. The method, when correlated with a terrestrially determined damage scale, can be used for rapid evaluation of pollution damage to large wooded areas.

14668 APTIC NO. 31833

Yonemaru, Chutaro

ON THE INJURIOUS EFFECTS OF SULPHUR DIOXIDE UPON PLANTS. *Noji Shikenjo Hokoku (Bull. Imp. Agr. Expt. Sta.), no 47, March 1927. 28 refs. Translated from Japanese. Mundus Systems, McGregor and Werner, Washington, D. C., 135p.*

The injurious effects on sulfur dioxide upon plants are relevant to the direct rays of the sun; no injuries were observed during the night or in a dark room. However, when a mixture of sulfur dioxide and aldehyde was applied to plants, the same injurious effects emerged in the dark room as under direct sunlight. These effects are therefore not caused by the sulfur dioxide alone. Aldehyde, produced by the dissolution of organic acid present in the plants, and a-Oxysulfosaure, a compound of sulfurous acid and formaldehyde produced by the union of sulfur dioxide, were also involved. That the injurious effects of sulfur dioxide were limited to instances involving direct sunlight was attributable to the fact that the formation of aldehyde is facilitated by direct sunlight. The sulfur dioxide penetrates into the plant foliage through the stoma as well as the drainage hole on the leaf margin. The stoma and drainage hole smeared by vaseline showed no symptoms of injury. The degree of effects of sulfur dioxide greatly differed due to dry or damp air. When the air was damp, sulfur dioxide inhaling the moisture was converted not only into a minute fog shape, but also into relatively heavy sulfurous acid. Compared with ordinary gas, its movement was slow and easily stopped by plants or other blocks, thus providing ample time for penetration into the foliage. The effect of sulfur dioxide upon the yield of crops varied according to the kind of crops; the density of gas and weather conditions, with the contact by 5/1,000,000 and more capacity of sulfur dioxide, increased the injuries. Greater injuries occurred before and after the blossom period. The contact of sulfur dioxide after the blossom period influenced the new seed quality. Lists of plants tested, injuries sustained, and lengths of testing times are also included. Author summary modified)

EFFECTS-MATERIALS

14669 APTIC NO. 32399

Aleksandrov, G. N. and Gu Lo-Guan

ELECTRIC STABILITY OF LINEAR INSULATORS AT A VARIOUS DEGREE OF POLLUTION. *(Elektricheskaya prochnost lineynykh izolyatorov pri razlichnoy stepeni zagryazneniya). Text in Russian. Elektrotekhinika (Moscow), 36(4):38-41, 1965. 6 refs.*

The results of experimental studies of electric stability of insulators as a function of pollution and intensity of their wetting are presented. At an increased degree of pollution (three to 10 mg/sq cm), electric stability of insulator garlands depends on intensity of wetting. Minimum electric stability was observed when insulators were wetted by fog with the intensity eight to 14 mm/hr. With the increase of the pollution degree the critical wetting intensity, corresponding to minimum electrical stability, increases. Wetting of polluted insulator garlands by fog was much more dangerous than much more intense wetting by rain. The choice of garland insulators is made on the basis of knowledge of distribution of intensity of wetting of isolators by fog. At the same time, one can limit oneself to studies of electric stability of insulating materials in a narrow range of wetting intensities in the vicinity of electrical stability minimum.

14670 APTIC NO. 32184

Bresle, Ake

EFFECTS OF SULFUR DIOXIDE ON VARIOUS MATERIALS. *In: Recommendations Relating to Norms for Sulfur Dioxide Content in Open Air. (Rekommendationer rorande riktvarden for svaveldioxihalt i utomhusluft). Swedish Government Air Pollution Board, Stockholm, Communication 6601, 1965 (?). Translated from Swedish by Scientific Translation Service, Inc., Santa Barbara Calif., p. 15-19, 1967.*

Impurities in city and industrial atmospheres, and primarily the sulfur oxides, increase considerably the corrosion rate of metallic materials, reducing the life of exposed structures. The source of increase sulfur content in the air may be sought in various places, but the increasing use of sulfur-containing petroleum products seems to be a dominating factor. Sulfur oxides also tend to break down paint and lacquer, and carbonate-containing materials such as limestone and marble are severely attacked by the sulfuric acid that is formed when petroleum products containing sulfur are burned. Generally there does not appear to be any lower threshold for sulfur dioxide concentration below which no observable increase in corrosion occurs.

14671 APTIC NO. 32089

Flatley, T. and N. Birks

OXIDATION OF IRON IN ATMOSPHERES CONTAINING SULPHUR DIOXIDE. *J. Iron Steel Inst. (London), 209(7):523-532, July 1971. 12 refs.*

Experiments carried out on the oxidation of pure iron in atmospheres of argon and sulfur dioxide between 500 and 900 C have shown that an initial constant reaction rate is followed by a parbolic rate period. The constant rate is controlled by diffusion of S02 through a boundary layer in the gas to the scale surface. During this period, iron oxide and iron sulfide form cooperatively to produce a lamellar structure. The various blocks of lamellae are inclined at various angles to the metal surface and result in a range of interlamellar spacings on polishing. The swift diffusion of iron ions through the continuous sulfide network thus provided maintains the iron activity at the scale/gas interface at a high value. The formation of iron oxide produces conditions favorable for iron sulfide to form and lamellar scale growth is propagated. When the scale reaches a thickness where the ionic flux is comparable with the S02 flux, only those lamellar blocks most suitably aligned, i.e., perpendicular to the metal surface, continue to grow. This results in the formation of a very rough surface. Eventually, with the higher S02 partial pressures, a layer of oxide free from sulfide begins to form, leading to true diffusion-controlled parabolic kinetics. This condition occurs earlier as the atmosphere is made more oxidizing. The effect of scale-metal separation at low S02 contents can cause the observed reaction rates to fall off in a manner similar to diffusion-controlled kinetics. At 550 C after an initial slow formation of oxide free from sulfide, a very rapid reaction occurs resulting in the formation of bursts of an oxide-sulfide agglomerate all over the surface. (Author abstract)

14672 APTIC NO. 31954

Marcus, Heinz

PREREQUISITES AND EXAMPLES FOR THE CONVERSION OF PULVERIZED COAL-FIRED FURNACES TO OIL AND GAS-FIRED SYSTEMS. *(Grundsaetze und Beispiele fuer die Umstellung kohlenstaubgefeuerter Kessel auf Oel- und Gasfeuerung). Text in German. Energie Tech., 23(7):235-241, July 1971.*

With the conversion of pulverized coal-fired furnaces to oil firing, low and high temperature corrosion must be taken into account. Low temperature corrosion is caused by the sulfur contained in the heavy fuel oil or in the combustion gases. The dew point of the flue gas is raised when the sulfur dioxide is oxidized to sulfur trioxide. While S03 formation can theoretically be prevented through near stoichiometric operation of the furnace, this is not always feasible with older furnace models. Silicon carbide particles are also oxidized in the presence of oxygen to silicon dioxide with carbon dioxide formed. Fortunately, this conversion takes place rather slowly at expected surface temperatures.

14673 APTIC NO. 32160

Schikorr, G.

ATMOSPHERIC RUSTING OF IRON. *(Das atmosphaerische Rosten des Eisens). Text in German. Korrosion Metallsch., 17(9):305-313, Sept. 1941. 13 refs.*

Atmospheric corrosion was studied for a year on suspended small plates of various types of iron to determine the relationship between rusting, seasons, and sites. While the roughness of the surface and wind direction had no effect on rusting, the height above ground had a slight but definite effect. Plates placed on roofs rusted somewhat faster than those suspended immediately above the ground, because of a greater supply of sulfur oxides by the wind at the higher altitude. They rusted five times faster in winter than in summer, which can be attributed to combustion gases from furnaces and to higher humidity. Rusting velocity was approximately proportional to the root of the atmospheric sulfur dioxide level. Over periods of less than one month, rusting was accelerated by the already present rust. Over longer periods, rust provided a certain protection from further rusting and rusting velocity was reduced to about 50%. Plates exposed to the atmosphere but shielded from rain rusted half as fast as platelets exposed to rain. Generally rusting velocity increased with increasing pollution from 0.01 mm/year in remote areas with long winters to from 0.08 to 0.15 mm/year in industrial areas and from 0.06 to 0.017 mm/year on the seacoast. In most cases small amounts of phosphorus or of copper inhibited rusting even over short periods of time. Cast iron rusted somewhat faster than steel.

14674 APTIC NO. 31810

Ustinov, Yu. K.

CHEMISORPTION OF CARBON MONOXIDE ON TANTALUM. *Soviet Phys.-Tech. Phys. (English translation from Russian of: Zh. Teckh. Fiz.), 16(2):311-314, Aug. 1971. 5 refs.*

The chemisorption of carbon monoxide on polycrystalline tantalum strips was studied by the flash method with a pulsed mass spectrometer. Flash heating of a tantalum strip with a coating adsorbed at 300 K led to diffusion of half the coating into the interior of the adsorbent. The subsequent desorption had two phases: desorption of carbon monoxide from the bound state, followed by diffusion of carbon monoxide from within the specimen to its surface. The carbon monoxide that diffused into the tantalum had a heat of chemisorption of 280 kcal/mole, twice that for the bound stage. As the dissociation energy of carbon monoxide molecules at the tantalum surface was less than or equal to 250 kcal/mole, half the adsorbed molecules dissociated at 300 K.

14675 APTIC NO. 31970

Vesely, V.

RESISTANCE TO CORROSION OF ALUMINUM COATINGS IN ATMOSPHERIC CONDITIONS, PARTICULARLY IN POLLUTED ATMOSPHERES. *(Resistance a la corrosion atmospherique et particulierement dans des atmosphrees polluees, de revetements d aluminium metallises). Text in French. Soudage Tech. Connexes, 25(516):243-246, May-June 1971.*

Aluminum coatings formed by spraying molten metal under pressure on metal surfaces consist of metal particles from 10 to 100 micron covered by a film of aluminum oxide; the coating possesses a lamellary structure. The danger of corrosion derives primarily from communicating porosity which bares underlying metal to the atmosphere. The effectiveness of the protection of aluminum coatings in a humid climate is due to electrochemical phenomena. Adhesion of the coating is a function of the geometric and chemical condition of the underlying surface. The degree of porosity of a coating depends on its thickness and on the angle of impact during spraying. For optimal protection, the impact angle must not be less than 45 degrees and the thickness can practically be limited to a single thickness of 100 micron. Coatings containing 99.5% Al offer best protection to corrosion against ferrous metals in a strongly corrosive atmosphere. First class resistance to corrosion is characterized by a daily loss of substance of less than 0.1 g/sq m, second class resistance to corrosion has a loss between 0.1 and 1 g/sq m/day, third class has a loss exceeding 1 g/sq m/day. Generally, the protective life of aluminum coatings under practical conditions is always shorter than that calculated for uniform corrosion because of pinpoint corrosion due, for example, to chlorides in a marine atmosphere.

EFFECTS-ECONOMIC

14676 APTIC NO. 31814

Anderson, H. S., R. E. Paddock, R. O. Lyday, M. E. Fogel, E. L. Hill, and F. A. Ayer

USER S MANUAL AUTOMATED PROCEDURES FOR ESTIMATING CONTROL COSTS AND EMISSION REDUCTIONS FOR SPECIFIED AIR POLLUTION SOURCES. (FINAL REPORT). *Research Triangle Inst., Research Triangle Park, N. C., Operations Research and Economics Div., APCO Contract CPA 70-60, RTI Proj. OU-534, Rept. FR-OU-534, APTD-0665, 352p., Dec. 1970.*

NTIS: PB 198779

A user s manual is presented enabling other researchers to use and modify the computer programs developed within this research project for estimating the costs and emissions of specified industrial air pollution sources. The output from each source program consists of emission estimates, both before and after control, as well as required control costs on a plant by plant basis. The manual describes the input requirements, operational characteristics, and output characteristics for each program. A master report generating program was also developed. This program uses as input the output from one, all, or any combination of source programs; it generates sumary data in the form of a single industry or multiple industry, and sums within a range of desired geographical areas. The area may be a single or combinations of Air Quality Control Regions or states. Again, the manual describes the input requirements, operational characteristics, and output characteristics of the report generating program so that the user has maximum flexibility in the use of the present system and, in addition, has the ability to redesign the system to his specific needs. Computer programs are presented for petroleum refining, phosphate fertilizer, kraft pulping, foundry operations, sulfuric acid, primary nonferrous metallurgy, steam-electric power plants, and other industries. (Author abstract modified)

14677 APTIC NO. 32249

Fink, F. W., F. H. Buttner, and W. K. Boyd

TECHNICAL-ECONOMIC EVALUATION OF AIR POLLUTION CORROSION COSTS ON METALS IN THE U. S. (FINAL REPORT). *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., 148p., Feb. 19, 1971. 109 refs.*

NTIS: PB 198453

Two approaches were undertaken to develop a more realistic assessment of the added cost of corrosion damage to the Nation resulting from the exposure of metallic systems and structures to polluted atmospheres, both presently and by 1980. The first approach was to correlate marginal costs with air pollution levels in four metropolitan districts, each having a different average level of atmospheric pollution, covering the range from slightly contaminated to severe. Because representative regional statistics for assessing corrosion damage do not exist, and the time required to develop them was far beyond the limitations of this project, the first approach was dropped. A second approach was then devised, employing applicable national shipment/value data from the U. S. Department of Commerce to compute average pollution costs on a national basis. Data developed by the Census Bureau in the Standard Industrial Classification were cross checked, where possible, with industry-association statistics. The results were then applied to a formula, which relates value with air pollution damage to metals in use, and which makes it possible to compute corrosion damage accurately on a national scale. The major factors affecting the corrosivity of the atmosphere are the level of pollution and the degree of moisture present. (Author summary modified)

14678 APTIC NO. 31744

Jackson, W. E. and H. C. Wohlers

DETERMINATION OF REGIONAL AIR POLLUTION CONTROL COSTS AND THE COST OF AIR POLLUTION REDUCTION IN THE DELAWARE VALLEY. *Air Pollution Control Assoc. Pittsburgh, Pa., 31p., 1971. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-163.)*

A procedure was developed for determining costs to reduce air pollution emissions in a metropolitan area. Methods are sufficiently general to be applicable in any region and sufficiently comprehensive to include analysis of all major sources, future trends, control limitations, and other factors of importance in a dynamic community. The analytical procedure examines relationships between emission inventories, regional growth, control trends, alternate control schemes, control costs, and optimum cost-effectiveness. The cost analysis procedure was tested by application to the Delaware Valley. Costs were determined for reducing emissions to various levels between the years 1960 and 2000. Emissions from private automobiles were projected to decrease below the 1960 emission rate by 1980, at a cost of 150 million dollars/yr. Stationary source emissions of sulfur dioxide and particulates can be reduced to 1960 levels by 1980 for 37 million dollars/yr if least cost procedures are used (selective abatement). Uniform conversion to 0.5% sulfur fuel oil used in power generation can effect a similar reduction in emissions for about 94 million dollars/yr in 1980. Other cost analysis comparisons are made and projections to the year 2000 are included. (Author abstract modified)

14679 APTIC NO. 32420

Lee, Byron, Jr.

POWER, POLLUTION, AND PROFITS. *Preprint, American Inst. of Industrial Engineers, New York, p. 21-25, 1970. (Presented at the Joint Engineering Management Conference, 18th, The Engineering Manager and the Progress-Profit Dilemma, Chicago, Ill., Oct. 29-30, 1970.)*

The primary responsibility of the electric power industry is to provide the nation with adequate and reliable amounts of electricity, and to do so at the lowest possbile cost. Energy policy should prescribe accelerated research and development on concepts for improving the environment. Large generating complexes away from urban areas appear to offer the best solution to providing environmental protection and meeting the nation s power needs. Meanwhile, the electric power companies must pursue more immediate abatement measures. Questions of cost bear urgently on pollution control strategies, particularly with respect to choice and time of control actions. The success of pollution control hinges on the profit motive. If the electric companies are to succeed in meeting society s expectation for more energy and a better environment, then they must be given the economic incentive to test new ideas in technology and operations. Utilities must be assured the financial resources necessary to encourage these developments.

14680 APTIC NO. 31805

Ottaviano, Victor B. and Sheldon Lazan

AIR POLLUTION ABATEMENT MARKET FOR THE SHEET METAL INDUSTRY. *Heating Air Conditioning Contractor, vol. 62:26-31, Aug. 1971.*

Approximately one billion dollars of sheet metal work will be required for such air pollution control equipment as dry cyclones, baghouses, spray chambers, packed towers, venturi scrubbers, fume incinerators, and electrostatic precipitators. This equipment will place greater demands on the sheet metal contractor than heating, ventilation, and air conditioning installations. Designs must be better and the sheet metal work resistant to corrosion and erosion. A chart for estimating the cost of in-place sheet metal ductwork is included. The chart, which is used by plotting ductwork weight against cost per pound, allows the contractor to arrive at a price including the size of the job, the number of fittings on the job, the ceiling height, and the local wages.

14681 APTIC NO. 31813

Royce, Charles J.

AVAILABILITY OF RESIDUAL FUEL OIL. (FINAL REPORT). *Kellogg (M. W.), Co., Piscataway, N. J., Research and Engineering Development, APCO Contract CPA 70-68, Rept. RED 70-1248, Task 2, APTD-0668, 89p., Dec. 31, 1970. 10 refs.*

NTIS: PB 198817

Statistical data relating to the recent history of the crude oil and residual oil situation throughout the world, with particular emphasis on the United States, is reviewed. Present and future production capabilities of existing domestic and foreign refineries, which are engaged in supplying the United States residual fuel oil, (RFO) requirements, are estimated and projected with respect to production capabilities after the addition of hydrotreating facilities and the incremental cost of producing low sulfur RFO as a result of such modifications. Domestic production of RFO has been systematically reduced. For the period 1971-1975 it is expected to be in the 750,000 to 850,000 barrels per calendar day (BCD) range, of which 150,000 to 175,000 BCD would be in the 0-1.0% sulfur content range. The addition of hydrotreating facilities to reduce the RFO pool to 1% sulfur content would decrease total RFO production by 10%. A capital investment of roughly 300 to 400 million dollars would be required and incremental production costs would vary from $0.75 to $1.85 per barrel with an overall United States average of $0.75 to $0.90 per barrel. Reduction to a 0.5% sulfur content would decrease RFO production by 25%. A capital investment of 700 to 1100 million dollars would be required and the incremental production costs would vary from $0.90 to $2.25 per barrel with an overall United States average in the $0.95 to $1.15 per barrel range. Eastern Hemisphere imports have increased to 14.2% of the total U. S. RFO imports. They are estimated at 225,000 to 300,000 BCD for the 1971-1975 period; 100,000 to 200,000 of this total will be in the 0-1% sulfur content range. Western Hemisphere production during 1965-1969 averaged 1,385,000 BCD of which 70% was imported into the United States. The production capability will increase by 1975 to 2,250,000 BCD, of which 1,140,000 will be low sulfur content RFO. The United States supply-demand analysis is computed for 1971-1975 and potential modifications to the world RFO supply are examined. (Author summary modified)

14682 APTIC NO. 32241

Sabin, W. W. and R. K. Scales

EVALUATION OF USE VS. NON-USE OF TETRAETHYL LEAD IN GASOLINE. *Public Health Service, Washington, D. C., Symp. Environ. Lead Contamination, 1965, p. 95-108. (Dec. 13-15.)*

NTIS: PB 198104

Economic aspects of the use of lead anti-knock compounds in gasoline are discussed. Data are presented for the refining industry raw material intake and product distribution for the base case using lead and a case simulating how the industry would be forced to operate if lead anti-knock compounds were unavailable. Raw material prices and product values assumed for this study also are shown. Processing equipment and operating costs for the various types of processing considered in this study are also indicated, as well as the throughput of material for various petroleum-refining processes. Properties of gasolines produced in the lead case and in the case with no lead are shown. The cost of making gasolines approaching the quality of today s gasolines without using lead anti-knocks is estimated to be 2.6 cents/gal for the U. S. refining industry as a whole. This is a 30% increase in the manufactured cost of gasoline.

14683 APTIC NO. 31747

Wright, Thomas J., William D. Dickerson, and Donald H. Lewis

A MODEL FOR ESTIMATING AIR POLLUTION CONTROL COSTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 35p., 1971. (Presented at the Air Pollution Control Association Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-144.)*

A Control Cost Model provides a computerized tool for generating cost and control effectiveness estimates for each point source of particulate and sulfur dioxide pollution within a region. For each source type, the model selects all applicable control devices, and computes an estimate of the costs using the device. The estimate includes consideration of manufacturers price (as a function of some measure of device size), installation costs, expected life, operations and maintenance labor requirements, operating costs, and pollutant disposal cost or credit. To illustrate usage of the control cost model, several typical emission source types were selected for study, including blast furnaces, incinerators, and power plants. The total annualized costs of applying each of the applicable control devices (including electrostatic precipitators, filters, flue gas desulfurization, and wet scrubbers) was computed, along with the operations and maintenance costs, the installed removal efficiency for particulates and SO2, the controlled emission rate, the exhaust gas volume and temperature, and the quantities of fuel consumed. (Author abstract modified)

STANDARDS AND CRITERIA

14684 APTIC NO. 32108

Japanese Industrial Standards Committee

CARBON MONOXIDE (CALIBRATION GAS FOR ANALYSIS OF AUTOMOBILE EXHAUST GAS). *(Issanka tanso (Jidosha haiki gasu bunseki no tame no koseiyo gasu)). Text in Japanese. JIS K 0502, p. 1-4, Feb. 1, 1971.*

The specifications of calibration gas (carbon monoxide) are stipulated for the nondispersive infrared gas analyzer used when measuring the density of C0 as specified in JIS D 1030 (providing for the continuous measurement methods for analysis of C0, carbon dioxide, and hydrocarbon). The calibration carbon monoxide is classified by concentration: CM1, CM2, CM5 and CM10. Their approximate values (v/v%) of concentration are 1,2.5, and 10, respectively, while their ranges of concentration (v/v%) are 0.80-1.20, 1.80-2.20, 4.50-5.50, and 8.00-10.0, respectively. Two methods for analysis are described: the condensation/vaporization methodd and the gas chromatographic method. In the condensation/vaporization method, C0 in a sample gas is reduced to C02, condensed, and separated by liquid air and vaporized. Then the gas pressure in a specified volume is measured to determine the carbon monoxide. The results obtained should be authenticated by gas chromatography when necessary. In the gas chromatographic method the detector should be of the heat-conductivity type, the separator tube 3-5 mm in inner diameter and 50-200 cm in length, the grains of active carbon or zeolite 150-500 micron in size, and the carrier gas either helium or hydrogen of 99.8 v/v% or higher purity. The peak area ratio between the effluent C0 and the high-purity C0 is calculated to obtain the density. These results should be authenticated by the condensation/vaporization method when necessary. The analytical apparatus, reagents, operating procedures, and calculation methods are described for both methods. Instructions as to what is to be indicated on the calibration gas container and in the test data record are included.

14685 APTIC NO. 32120

INDUSTRIAL EMISSIONS: AT LAST, SOME NUMBERS. *Environ. Sci. Technol., 5(9):748-749, Sept. 1971.*

The Environmental Protection Agency has published a list of emission performance standards which will apply to all air emissions from certain types of new industrial plants. In addition, EPA is providing its regional offices with a set of effluent reference guides covering the feasibility of controlling liquid industrial wastes. The proposed EPA sampling method for stack emissions specifies taking a 250 F sample, cooling it to 70 F, and then determining particulate matter. The reference guides establish realistically achievable levels of control for waste streams in different segments of industry. The immediate purpose of the guides is to assist regional EPA offices which, under an agreement between EPA and the Corps of Engineers, will be asked to make a determination regarding the acceptability of applications for discharge permits.

14686 APTIC NO. 32182

Swedish Government Air Pollution Board, Stockholm

RECOMMENDATIONS RELATING TO NORMS FOR SULFUR DIOXIDE CONTENT IN OPEN AIR. *(Rekommendationer rorande riktvarden for svaveldioxidhalt i utomhusluft). Communication 6601, 1965 (?). Translated from Swedish by Scientific Translation Service, Inc., Santa Barbara, Calif. 32p., 1967.*

The medical background for recommendations relating to norms for sulfur dioxide content in the air is discussed. Studies show a correlation between the occurrence of disease of the respiratory tract and the degree of air pollution. Gaseous pollutants causing damage are sulfur oxides, nitrogen oxides, oxidizing agents, and aldehydes. The effects of SO2 on plants and animals are reviewed. Herbs, grasses, and woody plants often show typical damage at concentrations as low as 30 ppm. Impurities present in city and industrial atmospheres, primarily sulfur oxides, increase the corrosion rate of metallic materials, reducing the life of exposed structures. Meteorologic and statistical aspects are also discussed. Methods for determining short-term and daily average values of SO2 and for continuous measurement are described. For daily averages thorine method is most commonly used. The air sample is passed through 50 ml of 1% hydrogen peroxide solution and titrated with barium with thorine as an indicator. The most common method in Sweden for short-term concentrations depends on the absorption of SO2 in chloromercurate solution. The SO2 is then determined by a colorimetric reaction produced by the addition of pararosaniline hydrochloride.

14687 APTIC NO. 31821

Barth, D. S.

IMPORTANCE OF AIR QUALITY MEASUREMENTS TO CRITERIA, STANDARDS, AND IMPLEMENTATION PLANS. *Preprint, American Chemical Society, Washington, D. C., 8p., 1971. (Presented at the Symposium on Determination of Air Quality, Los Angeles, Calif., March 29-April 2, 1971.)*

To fully define the quality of air with respect to a specified air pollutant, it is first necessary to define the concentration in ambient air of that pollutant, the length of time the air was sampled, and the locations to which the observed concentrations were applicable. Furthermore, the sampling device used, its sampling rate, and the analytical procedure used to measure the pollutant must be described. From this knowledge, it is possible to derive a collection of necessary emission standards for the significant sources that will ensure that the air quality standard will not be exceeded. Reasons for air quality measurements are cited. The Environmental Protection Agency is directed by the Clean Air Act to publish criteria and control technique documents for those air pollutants which have an adverse effect on the public health and welfare. National emission standards are required for stationary and mobile sources.

14688 APTIC NO. 31750

Crofoot, Emory J.

SIMPLIFIED VISIBLE EMISSION STANDARD. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 7p., 1971. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-51.)*

The new visible emission standard, which replaces the Ringelmann Chart and the equivalent opacity standard, is based on the opacity of a plume expressed in percent. It is easier for the smoke reader to use since training and background on one standard only for any visible emission, regardless of content or color of emission is required. The weak point of the standard is its enforcement by a subjective test. This can be overcome by a good training program and a written record logging the smoke reader s actual experience in using the standard. If the emission standard exempts uncombined water, the emission must be read downstream from the evaporation point. A scientific instrument, perhaps the laser, should be developed for enforcement of visible emission standards. This would eliminate the question of accuracy of the subjective eyeball test. (Author abstract modified)

14689 APTIC NO. 32359

Engel, R. E. and D. S. Barth

RELATIONSHIP OF AIR QUALITY MEASUREMENTS TO CRITERIA AND EMISSION STANDARDS. *Preprint, Air Pollution Control Office, Research Triangle Park, N. C., Bureau of Air Pollution Sciences, 12p., 1971.*

The Clean Air Amendments of 1970 defined specific authorities given to its Administrator, the Environmental Protection Agency. Criteria and control techniques documents will be published for those air pollutants that have an adverse effect on public health and welfare. National ambient air quality standards will be promulgated. Standards of performance and emissions for new and existing stationary sources of hazardous air pollution must be developed and promulgated, on a time scale detailed in the Clean Air Amendments of 1970. To develop most of these standards, the relationship between existing ambient air quality and emissions must be investigated thoroughly and models applied to actual urban situations. The Federal goal is to achieve the ambient air quality standards through the prevention or control of emissions to the atmosphere. Applications to electric power plants are also discussed.

14690 APTIC NO. 32485

Firnhaber, R. B.

ENVIRONMENTAL PROTECTION IN THE UNITED STATES. *(Umweltschutz in den USA). Text in German. VDI (Ver. Deut. Ingr.) Nachr. (Berlin), 25(27):1, 4-5, July 1971.*

Progress in environmental protection is compared for the United States and West Germany. More than 3.5 million tons of refuse are collected annually in the United States. In 1966, approximately one million tons of sulfur dioxide were emitted into the atmosphere by power plants and domestic heaters in New York City; by 1970, the concentration was reduced to 379,000 tons, mainly by reducing the sulfur content of the fuel oil. In 1970, the Environmental Protection Agency was created to set emission and air quality standards. The primary standards indicate the permissible degree of air pollution, which even over long-term exposure causes no harmful effects; the secondary standards set the threshold concentrations of the harmful pollutants. Primary and secondary standards are included for SO2, dust, carbon monoxide, ozone, nitrogen oxides, and methanes. In West Germany, the standards are generally more stringent. The daily dust concentration is limited to 0.42 g/sq m. The maximum allowable SO2 concentration is 0.4 mg/cu m of air. The development of desulfurization processes for waste gases is at about the same stage for both countries. The United States has more stringent regulations for automobile exhaust gas emissions than does West Germany.

14691 APTIC NO. 32463

Jorissen, H. Dieter

AUTOMOBILE EXHAUST GASES: PREVENTIVE RATHER THAN CORRECTIVE MEASURES. *(Automogilabgase: Vorbeugen statt heilen). Text in German. VDI (Ver. Deut. Ingr.) Nachr. (Berlin), 25(31):1, 4-5, Aug. 1971.*

Limitations were set for the emission of automotive exhaust gases effective October 1, 1971 in all the Common Market countries. Hydrocarbon emissions are limited to 8 g/test for vehicles weighing 750 kg and 12.8 g/test for vehicles weighing 2150 kg. Carbon monoxide emissions may not exceed 100 g/test for the 750-kg vehicles and 220 g/test for the 2150-kg vehicles. Plans to cut these limits by 30% in the fall of 1972 are examined. Control methods and equipment are being developed by research institutes in Europe (West Germany) to limit diesel engine emissions, which contribute 0.1-0.3% of the C0 emission, 1% of the unburned hydrocarbon emission, 100% of the soot, and 12% of the nitrogen oxide emissions. The Economic Council has set standards to limit soot emissions; effective federal standards in the United States are less stringent. The mechanism of the Otto and diesel engines is being studied with respect to the processes in the reaction ozone in the cylinder. The ignition system and timing influenced the emission of hydrocarbons.

14692 APTIC NO. 31917

Muth, Robert J.

ORIGINS AND CURRENT STATUS OF SULFUR OXIDE EMISSION STANDARDS FOR NONFERROUS SMELTERS. *Mining Congr. J., 57(8):63-70, Aug. 1971. 24 refs.*

Federal and state air pollution agencies and the copper smelting industry are at odds over the requirement that copper smelters be permitted to emit no more than 10% of the sulfur contained in materials processed. This requirement, generally referred to as a 90% emission control standard, is forcefully advocated by the Air Pollution Control Office. It has been adopted by the states of Montana, Arizona, and Nevada, and by the Puget Sound Air Pollution Control Agency in Washington. However, a combination of economic and technical factors make implementation of the standard impossible for almost all existing smelters. Compliance with the standard by converting sulfur dioxide in the more concentrated gas streams to sulfuric acid would produce enormous amounts of acid for which no ready markets exist. The more dilute gases, which can account for 25% or more of total sulfur dioxide produced in the smelting process, are not amenable to conventional treatment. Thus, existing smelter processes may have to be replaced with new processes capable of generating more concentrated gas streams. The capital costs for new process equipment and pollution control equipment are estimated at over half a billion dollars, based on present costs. Since nonferrous metals are international commodities, the domestic industry would be unable to recoup increased costs by increasing prices.

14693 APTIC NO. 31843

Rossin, A. David and John J. Roberts

EPISODE CONTROL CRITERIA AND STRATEGY FOR CARBON MONOXIDE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 26p., 1971. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-55.)*

Carbon monoxide differs from other pollutants with respect to health effects and types of emission sources. The effects of non-toxic CO levels are temporary and reversible. Primary sources are automobiles and trucks, and concentrations are often highly localized. Therefore, control strategies developed for other pollutants are not applicable to CO episodes. The key element in CO episode control is a forecast, in which the potential severity of conditions is determined. Criteria are established and control actions can be taken to prevent substantial harm to the health of the population. Health effects from CO are related to the carboxyhemoglobin level of the blood. A graph is presented which predicts COHb levels as a function of CO concentration and exposure time. When forecasts are made, the following factors are taken into account: meteorology (time that adverse conditions may persist); predictable traffic density variations; and effective exposure time for people. If the forecast exceeds 4.5%, a CO alert is declared. This gives a margin to prevent COHb levels from exceeding 5%. A 7% COHb forecast calls for declaration of an emergency. The location, traffic situation, and severity are evaluated and control actions initiated, such as mitigating the effects of traffic jams, prohibiting engines left idling, and rerouting traffic. During an emergency, traffic should be restricted to authorized vehicles only. (Author abstract modified)

14694 APTIC NO. 32363

Smith, W. Vernon

ON-LINE DIGITAL PROCESSING OF VEHICLE EXHAUST ANALYSIS DATA. *Instrument Society of America, Pittsburgh, Pa., Symp. Environmental Pollution Instrumentation, Los Angeles, Calif., 1967, p. 40-48. 1 ref. (May 31-June 2.)*

Government air pollution standards specify the method of measuring carbon monoxide and unburned hydrocarbons in vehicle exhaust gas with nondispersive infrared analyzers. The standards require that averages be computed from concentration values taken for 42 different conditions of engine operation, and weighted in proportion to their occurrence in a typical day s driving. The processor described employs analog-to-digital data acquisition and digital computing equipment to calculate the averages on-line. The calculations also include linearization, calibration corrections, time-averaging, compensation for instrument time delays, and units conversion. Off-line programs assist the operator during setup and calibration. (Author abstract)

14695 APTIC NO. 31968

Yamamoto, Norimasa

ON EMISSION STANDARD OF SMOKE (HARMFUL SUBSTANCES) BASED ON AIR POLLUTION CONTROL LAW. *(Taiki osen boshiho ni motozuku baien -- yugai busshitsu -- no haishutsu kijin ni tsuite). Text in Japanese. Preprint, Smaller Enterprises Promotion Corp. (Japan) 72p., 1971. (Presented at the Public Nuisance Prevent. Tech. Seminar, Japan, 1971.)*

Characteristics of smoke, dust collection equipment, average particulate diameter, and other factors are tabulated. The number of boilers in Tokyo, Osaka, and Kanagawa are compared. The emission standard for dust is 0.06 g/N cu m-0.20 g/N cu m for boilers and furnaces, in newly constructed installations, which utilize heavy oil as fuel. The average cadmium concentration at nine monitoring stations in 1969 was 0.020 micrograms/cu m. Environmental pollution due to heavy metals is also considered. At 0.1 ppm, the odor of chlorine can be detected with slight irritation; at three to six ppm, there is irritation of the eyes, nose, throat, and headache, while life is threatened at 14-21 ppm. Chlorine also damages plants after about 0.5 ppm. Chlorine, up to 0.5 ppm, is contained in tap water. The environmental standard should be less than 0.02 ppm. Even small amounts of fluorine in the atmosphere can damage plants, and the standard should be two to five micrograms/cu m. Above two to eight ppm of F, teeth have motley patterns, and eight to 15 mg/day for 10 years would bring about softening of the bone. Standards are also given for sulfur dioxide, carbon monoxide, oxidants, hydrocarbons, and nitrogen dioxide. Air pollution control agencies, districts, plans and alerts are mentioned.

LEGAL AND ADMINISTRATIVE

14696 APTIC NO. 31740

Battelle Memorial Inst., Columbis, Ohio, Columbus Labs.

SUMMARY OF THE 5-YEAR COMBUSTION R AND D PLAN. *In: The Federal R and D Plan for Air Pollution Control by Process Modification. APCO Contract CPA 22-69-147, Rept. APTD-0643, p. IX-1 to IX-16, Jan. 11, 1971.*

NTIS: PB 198066

Several aspects of the five-year combustion research and development plan, which is directed to the control of pollutant emissions from stationary and vehicular combustion sources, are considered in order to provide a proper perspective for its utilization. These include the limitations of scope of the plan, its organization and problems of allocating resources, the presentation of competing research opportunities, and the provision of adding new R and D on new concepts not now identified or for accelerating on-going R and D.

14697 APTIC NO. 32049

New Jersey State Dept. of Environmental Protection, Trenton, New Jersey Clean Air Council

REPORT OF THE NEW JERSEY CLEAN AIR COUNCIL ON THE STATUS OF AIR POLLUTION FROM MOBILE SOURCES WITH RECOMMENDATIONS FOR FURTHER ACTION. *44p., July 1970.*

Air pollution from mobile sources in New Jersey is reviewed. Recommendations for emission control through engine modifications, traffic monitoring, fuel and emission criteria, vehicle use controls, and controls on vehicle emission points are developed. Programs involving state action and compliance with federal standards are discussed. Prospects for low emission vehicles, federally supported mass transportation programs, and industry programs are examined. A proposed New Jersey emission inspection system is defined.

14698 APTIC NO. 32147

Colorado State Dept. of Public Health, Denver, Air Pollution Control Section

COLORADO AIR POLLUTION CONTROL. *75p., 1969.*

The Colorado State Health Department feels that the concept of preventive action takes precedence over action based only on proven adverse effects; maximum control, utilizing existing technology, takes precedence over delay until technology develops; stringent emission control at the source takes precedence over the use of the atmosphere to dilute the air contaminants; and conservation and non-degradation of air resources takes precedence over delay and apathy until the problem develops. Proposals for changes in 1970 legislation were listed. Ambient air standards, emission standards, nuisance prevention, emission notices, a variance board, and adequate budgetary appropriations were considered. Enforcement activities were described. Six air pollution control areas were established. Open burning was curtailed; positive court actions were upheld by the State Air Pollution Control Act. Smoke emission limitations against automobiles and trucks are being enforced. Legal aspects of air pollution control in Colorado were also discussed. An emission inventory was made, and an air monitoring program was established. Emission inventory classifications are given for particulates, carbon monoxide, hydrocarbons, nitrogen oxides, sulfur oxides, and aldehydes. The stations are listed by designated air pollution control data, the sampling period involved, and the number of samples taken. The data from each station are presented. An odor survey and tracer study were also conducted. Public education is also being enhanced. Meteorology, wind, diffusion models, and inversions are also discussed.

14699 APTIC NO. 32153

Sacramento County Air Pollution Control District, Calif.

RULES AND REGULATIONS. *13p., 1971.*

Rules and regulations governing air pollution emissions and control are reviewed for Sacramento County. General terms and standard conditions are defined. Emission standards are established for dust, condensed fumes, open fires, incinerator burning, particulates, and specific contaminants (sulfur dioxide and carbon dioxide). Procedures before the hearing board are included.

14700 APTIC NO. 32161

Ventura County Air Pollution Control District, Calif.

RULES AND REGULATIONS. *16p., Oct. 22, 1968.*

The rules and regulations governing air pollution emissions and control are reviewed for Ventura County. General terms are defined and permits and fees are presented. Emission standards are designated for particulate matter, opacity of pollutant, specific contaminants (sulfur dioxide and carbon dioxide), organic gases, open fires, incinerators, and orchard heaters. Standard analytical methods and rules for sampling and testing facilities are included.

14701 APTIC NO. 32171

Reno, Sparks, and Washoe County District Board of Health, Nev.

AIR POLLUTION CONTROL REGULATION. *24p., Sept. 18, 1969.*

Air pollution control regulations are presented for the cities of Reno and Sparks and Washoe County. General terms are defined and the powers and duties of the Board of Health are delineated. Emission standards are derived for visible air contaminants, odorous or gaseous emissions, particulate matter, sulfur compounds (sulfur dioxide), combustion contaminants (carbon dioxide), scavenger plants, dusts, fumes, open fires, incinerators, sulfur content of fuels, gasoline loading and unloading, storage of petroleum products, and sand. Registration requirements and penalties for violations are included.

14702 APTIC NO. 32193

Swedish Dept. of Justice, Stockholm

SWEDISH CODE OF STATUTES NO. 387. *In: Legislation on Protection of the Environment. June 24, 1969. Translated from Swedish by McGregor and Werner, Inc., Washington, D. C., Mundus Systems, p. 1-25.*

A Law on the Protection of the Environment is presented, applicable to the discharge of water, solid material, or gas from terrains, structures, or installation, into water courses, lakes, or other water surface, and to the use of terrains, structures, or installations in a manner which may bring about damage to the environment through pollution of air, noise, concussion, light, or other agencies, if the damage is not altogether accidental. Committee for Environmental Protection Permits may authorize activities dangerous to the environment. The King may prescribe that certain factories shall not be created. The Permit Committee consists of a chairman and three other members. For the purpose of affording protection against activity dangerous to the environment, supervision shall be carried out by the States nature protection office and by provincial governments.

14703 APTIC NO. 32194

Swedish Dept. of Justice, Stockholm

SWEDISH CODE OF STATUTES NO. 388. *In: Legislation on Protection of the Environment. June 24, 1969. Translated from Swedish by McGregor and Werner, Inc., Washington, D. C., Mundus Systems, p. 26-43.*

A proclamation regarding protection to the environment is presented in which factories needing authorization to be set up were listed. These include mines, sintering plants, metal plants, cement factories, sugar factories, dairies, slaughterhouses, breweries, tanneries, chemical factories, fertilizer factories, rubber factories, pharmaceutical factories, refineries, atomic power installations, steam power plants, coal or gas works, and waste treatment and disposal installations. The procedure before the Permit Committee and State Health Care Office is outlined.

14704 APTIC NO. 32195

Swedish Dept. of Justice, Stockholm

SWEDISH CODE OF STATUTES NO. 395. *In: Legislation on Protection of the Environment. June 24, 1969. Translated from Swedish by McGregor and Werner, Inc., Washington, D. C., Mundus Systems, p. 96-98.*

An amendment to the Health Protection Statute of December 19, 1958 is presented stating that the health protection committee shall see that reasonable measures are adopted for combatting water, air, and noise pollution. Special provisions are given prohibiting the installation of alteration of factories without prior examination by the Permit Committee for Protection to the Environment, the state nature protection office, or the provincial government.

14705 APTIC NO. 32196

Swedish Dept. of Justice, Stockholm

SWEDISH CODE OF STATUTES NO. 394. *In: Legislation on Protection of the Environment. June 24, 1969. Translated from Swedish by McGregor and Werner, Inc., Washington, D. C., Mundus Systems, p. 94-95.*

An amendment to the nature protection law of December 11, 1964 is presented stating that provisions are to be found in the Law on Protection of the Environment of May 29, 1969 regarding protection against pollution of water, pollution of air, noise, and ther such disturbances.

14706 APTIC NO. 32197

Swedish Dept. of Justice, Stockholm

SWEDISH CODE OF STATUTES NO. 392. *In: Legislation on Protection of the Environment. June 24, 1969. Translated from Swedish by McGregor and Werner, Inc., Washington, D. C., Mundus Systems, p. 57-58.*

An amendment of the proclamation of January 4, 1939 giving directions in the field of civil administration regarding limitations on the right to secure copies of public transactions is presented. Article Two was amended to read as follows: transactions having to do with the supervisory activity which is carried out in accordance with the Law on Protection of the Environment of May 29, 1969, and also corresponding supervisory activity in accordance with older provisions.

14707 APTIC NO. 32198

Swedish Dept. of Justice, Stockholm

SWEDISH CODE OF STATUTES NO 391. *In: Legislation on Protection of the Environment. June 24, 1969. Translated from Swedish by McGregor and Werner, Inc., Washington, D. C., Mundus Systems, p. 54-56.*

An amendment to the provincial government instruction of May 30, 1958 is presented stating that the provincial government shall concern itself with social welfare, planning and construction activity, nature protection including water and air protection, highway activity, traffic, and fire protection. The provincial government also has to deliver to the State s nature protection office proposals for the computation of national outlays for nature protection within the province.

14708 APTIC NO. 32199

Swedish Dept. of Justice, Stockholm

SWEDISH CODE OF STATUTES NO 390. *In: Legislation on Protection of the Environment. June 24 1969. Translated from Swedish by McGregor and Werner, Inc., Washington, D. C., Mundus Systems, p. 51-53.*

An amendment of the instruction of May 25, 1967 for the state s nature protection office is presented. The office is a central administrative authority for cases regarding the protection of nature, including air and water protection. The members of each of the nature protection and air protection councils are the director general and a maximum of nine other members.

14709 APTIC NO. 32200

Swedish Dept. of Justice, Stockholm

SWEDISH CODE OF STATUTES NO. 248. *In: Legislation on Protection of the Environment. June 24, 1969. Translated from Swedish by McGregor and Werner, Inc., Washington, D. C., Mundus Systems, p. 106-111.*

A proclamation regarding the real estate court is presented, designating public lower courts as real estate courts and indicating the judicial districts. A law-experienced member, other than the chairman, on a real estate court, and the technical member on a real estate court are appointed by the circuit court under which the real estate court falls. For each circuit within the judicial district of a real estate court, the circuit court under which the real estate court falls shall determine the number of jurymen who are provided. A separate register shall be kept for cases handled by the real estate court.

14710 APTIC NO. 32201

Swedish Dept. of Justice, Stockholm

SWEDISH CODE OF STATUTES NO 246. *In: Legislation on Protection of the Environment. June 24, 1969. Translated from Swedish by McGregor and Werner, Inc., Washington, D. C., Mundus Systems, p. 99-104.*

A law regarding the Swedish real estate court is presented. The real estate court exists in every province and takes up the matters and cases indicated in a special statute. The court consists of a chairman and four other members. The chairman is selected from among the qualified judges in the public lower court. The other members of the court shall include one qualified judge from a lower court with technical training and experience in the organization and appraisal of real estate.

14711 APTIC NO. 32202

Swedish Dept. of Justice, Stockholm

SWEDISH CODE OF STATUTES NO. 249. *In: Legislation on Protection of the Environment. June 24, 1969. Translated from Swedish by McGregor and Werner, Inc., Washington, D. C., Mundus Systems, p. 112-113.*

An amendment of the proclamation of November 2, 1962 concerning the judicial districts of the borough police courts is presented, stating that the superior court for a matter or case which is being pursued from a public lower court in possession of a real estate court is the circuit court under which the lower court falls.

14712 APTIC NO. 32203

Swedish Dept. of Justice, Stockholm

SWEDISH CODE OF STATUTES NO. 247. *In: Legislation on Protection of the Environment. June 24, 1969. Translated from Swedish by McGregor and Werner, Inc., Washington, D. C., Mundus Systems, p. 105.*

A proclamation regarding the promulgation of the law of May 29, 1969 concerning the real estate court is given. It was stated that the law of May 29, 1969 shall come into force on July 1, 1969.

14713 APTIC NO. 32204

Swedish Dept. of Justice, Stockholm

SWEDISH CODE OF STATUTES NO. 389. *In: Legislation on Protection of the Environment. June 24, 1969. Translated from Swedish by McGregor and Werner, Inc., Washington, D. C., Mundus System, p. 44-50.*

Instructions to the Permit Committee for Protection of the Environment are presented. The Committee will have a chief engineer and a secretary. Major questions of statute law, organization, proposals for budgetary presentations, and disciplinary punishments will be decided in plenary session. In plenary session cases the Committee is qualified to decide when all of its members are present. If any person present during the final consideration of a case or presentation has a dissenting opinion, it should be noted.

14714 APTIC NO. 32205

Swedish Dept. of Justice, Stockholm

SWEDISH CODE OF STATUTES NO. 393. *In: Legislation on Protection of the Environment. June 24, 1969. Trnaslated from Swedish by McGregor and Werner, Inc., Washington,' D. C., Mundus Systems, p. 59-93.*

Amendments to the water law are presented. Waste water is defined as overflow water, water used for industrial cooling, or drainage water. Waste run-off is regulated. Measures for combatting water pollution are outlined. The responsibility of a real estate owner is also established.

14715 APTIC NO. 32220

National Academy of Public Administration, Washington, D. C., Panel on Technology Assessment

A TECHNOLOGY ASSESSMENT SYSTEM FOR THE EXECUTIVE BRANCH. *85p., July 1970. 13 refs.*

NTIS: N70-38647

Organizational and administrative problems were examined that must be overcome if an effective technology assessment system in the Executive branch is to be created. Technology assessment in the Executive branch now suffers from two major drawbacks: the assessments usually are incomplete or promotionally biased, and their conclusions are not consistently conveyed to officials who can and should act upon them. Central responsibility for government-wide policy, coordination, and review of technology assessment should be vested in the Council on Environmental Quality. However, the Council can discharge this responsibility only by working closely with, and receiving the full support of, the Office of Science and Technology and the Office of Management and Budget. Technology assessment should be made a continuing responsibility of each Executive Department and Agency, and should be integrated into program formulation, review, decision, and execution through the planning-programming-budgeting system. Agencies should seek independent assessments from qualified groups at universities, Federal laboratories, private research institutes, or industry to supplement their own capabilities. Other recommendations concerning technology assessment are cited.

14716 APTIC NO. 32222

Colorado State Dept. of Public Health, Denver

A REPORT TO THE LEGISLATURE ON AIR POLLUTION IN COLORADO. ABRIDGED EDITION. *64p., 1964.*

A series of studies on air pollution problems and recommendations for ambient air standards and control measures were presented. Colorado is experiencing a rapid growth of population, urbanization, and sources of air pollution. Meteorological and topographical features over much of the State are conducive to the development of serious air pollution conditions. Air pollution was shown to cause serious health effects, including death. It also damages vegetables, animals, and property and limits visibility. Effects on health, vegetation, property, and visibility were reported. Recommended standards for ambient air quality in the State were presented. Air quality monitoring programs were conducted in six of the largest cities in Colorado. Three monitored areas (Denver Metropolitan Area, Boulder, and Pueblo) definitely do not meet ambient air quality standards and another area (Grand Junction) might not meet standards. Geographical air pollution basins of the areas that do not meet the standards, with the exception of Boulder, were outlined. Measures for the abatement of air pollution within the State were recommended. It was recommended that open burning and backyard incineration be prohibited. It was also suggested that incinerators be of multiple chamber design.

14717 APTIC NO. 32245

San Bernardino County Air Pollution Control District, Calif.

RULES AND REGULATIONS. *62p., Aug. 18, 1970. (Includes Amendments to San Bernardino County Air Pollution Control District Rules and Regulations).*

Rules and regulations concerning air pollution emissions and control in San Bernardino County are reviewed. General pollution terms are defined. Permits and fees for schedules of electric motor horsepower equipment, fuel burning equipment, electrical energy use, incinerators, stationary containers, and orchard heaters are discussed. Pollution emission standards are examined for particulate matter, specific contaminants (sulfur dioxide, carbon dioxide, and fluorine compounds), scavenger plants, dust, fumes, storage of petroleum products, open fires, incineration, oil effluent water separators, gasoline loading, sulfur content of fuels, gasoline specifications, organic solvents, architectural coatings, and fuel burning equipment. Procedures of the board are reviewed. Emergency regulations are determined for air sampling and sampling stations, alerts, communication systems, and toxic air pollutant levels of carbon monoxide, nitrogen oxides, sulfur oxides, and ozone.

14718 APTIC NO. 32272

San Diego County Air Pollution Control District, Calif.

RULES AND REGULATIONS. *34p., Aug. 1970.*

Rules and regulations governing air pollution emissions and control in San Diego County are reviewed. General terms and standard conditions are defined. Permits and fees are explained. Standards on emissions are examined with respect to the Ringelmann chart, particulate matter, specific contaminants (sulfur dioxide, carbon dioxide, and fluorine compounds), scavenger plants, dust, fumes, open fires, incineration, and sulfur content of fuels. Rules concerning orchard or citrus grove heaters and legal board procedures are determined.

14719 APTIC NO. 32308

TRW Systems Group, Washington, D. C., Washington Operations

AIR QUALITY IMPLEMENTATION PLANNING PROGRAM. VOLUME I. OPERATORS MANUAL. *National Air Pollution Control Administration Contract PH 22-68-60, 320p., Nov. 1970. 19 refs.*

NTIS: PB 198299

The Implementation Planning Program is a collection of computer programs designed to assist the state government in preparing their implementation plans for sulfur oxides and particulates. The regional air quality implementation process is based on the application of a set of stationary source emission controls in the form of emission standards. The many combinations of these standards result in a variety of alternative control strategies. Through application of computer simulation techniques, the Implementation Planning Program is used in selecting appropriate emission standards, evaluating the resulting air quality, and determining the costs associated with the various alternative control strategies. The individual programs, their input data requirements, and the output information generated are described in this volume. Sources such as fuel use, diffusion models, and various control equipment are mentioned.

14720 APTIC NO. 32354

Nordrhein-Westfalen Arbeits-und Sozialminister (West Germany)

PLANS AND GOALS OF THE STATE GOVERNMENT TILL 1975. *(Plaene und Ziele der Landesregierung bis 1975). Text in German. In: Reinhaltung der Luft in Nordrhein Westfalen. Essen, West Germany, Brinck and Co. KG, 1969, p. 84-93.*

The state government has adopted a new regional approach to all pollution control planning. Abatement programs instituted for Thomas steel converters, ore sintering plants, cokeries, foundries, and steam power plants will terminate in 1973. In selected industrial centers with high pollution emissions, all industrial, domestic, and automotive polluters will be rechecked and results of the survey will be used as a basis for pollution control improvement and for planning and legislative purposes. An emission register (map) of Cologne, Duisburg-Oberhausen-Muelheim an der Ruhr, Essen-Bottrop, Gelsenkirchen-Wanne/Eickel-Bochum, Gastrop-Rauxel, and Dortmund will be compiled and used for purposes of pollution forecasting. Measurement data show that chemical and petrochemical plants contribute an inordinately large share to overall pollution; these plants will have to install new equipment to reduce emissions of concentrated reaction gases, odorous gases, and gases with high particulate content. New monitoring programs will be instituted for fluorine, hydrocarbons, odorous sulfur and nitrogen compounds, hydrogen chloride, and oxidants and particulates in an area extending from Cologne to Dortmund. New regulations will be issued governing maximum permissible emissions from all domestic heating plants fired by oil, coke, or coal. The incineration of solid waste in heating plants will be prohibited.

14721 APTIC NO. 32382

Pima County, Air Pollution Control District, Ariz.

RULES AND REGULATIONS. SUPPLEMENTING ORDINANCE NO. 1967-10. *22p., Dec. 23, 1968.*

Rules and regulations on air pollution emissions and control are reviewed for Pima County. General terms and standard conditions are defined. Permits, fees, and fee schedules are determined. Emission standards are designated for visible emissions, particulate matter, emissions of gases, vapors, fumes, or odors, storage and handling of petroleum products, maximum allowable concentrations of sulfur dioxide, sulfuric acid, sulfur trioxide, and hydrogen sulfide, and open burning. Emergency procedures are outlined.

14722 APTIC NO. 32383

Clark County District Board of Health, Nev.

AIR POLLUTION CONTROL REGULATIONS. *29p., April 22, 1970.*

Air pollution control regulations are reviewed for Clark County. General pollution terms are defined and the organization of the Air Pollution Control Board, its powers, and duties, are determined. The registration and inventory of sources of pollution emissions, items requiring a registration certificate, and fees are listed. Standards are evolved for open burning, incinerators, visible air contaminants, particulate matter, dust and sand control, gasoline unloading, storage of petroleum products, and odors in the ambient air. Penalties and costs for violations are included.

14723 APTIC NO. 32462

Aitken, Allan

EXHAUST EMISSION LEGISLATION. *J. Automotive Eng., 2(5):9-14, May 1971.*

The Engine Engineering Department of the Ford Motor Company in Great Britain has been engaged in the research and control of car emissions for nearly a decade. No fewer than 140 different car engines have been tested. However, the lack of harmony in government legislation adds immeasurably to engineering costs and scatters the talent and expertise engine manufacturers have accrued in this field in many different, and often unrelated, directions. Manufacturers must press for international agreements on emission legislation and government direction and, at the same time, continually improve the emission characteristics in products without seriously compromising the tenet of value for money. Vehicle emission test procedures are presented tabularly for various countries including Belgium, Italy, France, West Germany, Sweden, Great Britain, the United States, Canada, and California. Items tested include hydrocarbons, nitrogen oxides, carbon monoxide, particulates, evaporation, crankcase emissions, and lead, at various engine cycles. Legislated emission standards are also given.

14724 APTIC NO. 32023

Bermingham, Paul E.

THE FEDERAL GOVERNMENT AND AIR AND WATER POLLUTION. *Bus. Lawyer, vol. 23:467-492, Jan. 1968. 140 refs. (Presented at the Corporate Cunsel Institute, 6th Annual, Northweastern University, Evanston, Ill., Oct. 13, 1967.)*

The role of the federal government in the air and water pollution problem is examined. Basic air and water quality criteria and standards are defined. Government regulations on water pollution, including the Rivers and Harbors Act, the Oil Pollution Act, the Pollution Treaty, and the Federal Water Pollution Control Act, are reviewed with respect to abatement proceedings and constitutionality. The Air Pollution Control Act and the Clean Air Act of 1963 are examined. Abatement proceedings and interstate compacts are reviewed, and the Air Quality Act of 1967 is discussed. The constitutionality of air pollution legislation, taxation, and compensation for loss of right to pollute are investigated.

14725 APTIC NO. 32019

Chass, Robert L., William B. Krenz, John S. Nevitt, and John A. Danielson

LOS ANGELES COUNTY ACTS TO CONTROL EMISSIONS OF NITROGEN OXIDES FROM POWER PLANTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1971. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-85.)*

Downtrends have been established in emissions of all major air pollutants in Los Angeles County except nitrogen oxides. Thermal electric power plants constitute the County's largest stationary source of nitrogen oxides and are clustered in discrete source areas where high ambient levels of nitric oxide plus nitrogen dioxide are recorded. In order not to nullify gains expected to be achieved from California's vehicular exhaust control program, and to prevent additional large point sources, the Air Pollution Control Board in December 1969 enacted Rule 67. This law placed a very stringent limitation on the mass emission rate of NOx from new fuel burning equipment. In January 1971, Rule 68 was enacted requiring substantial reductions in the concentration of NOx emitted from existing large combustion equipment. Both laws primarily affect power plants. Immediately following the adoption of Rule 67, its use and constitutionality were upheld in Superior Court. Research programs were accelerated, and it is now feasible to design a 300 megawatt gas-fired boiler to meet the limitation of the rule. Technological breakthroughs accomplished to meet Rule 67 will facilitate compliance with Rule 68. With this pair of statutes, Los Angeles County has the most stringent program in the country to control emissions of nitrogen oxides from stationary sources. (Author abstract)

14726 APTIC NO. 31767

Clement, J.

PROBLEMS OF AIR POLLUTION. *(Problematiek van de luchtverontreiniging). Text in Flemish. Meded. Vlaam. Chem. Ver., 32(6):187-194, Nov.-Dec. 1970.*

After a brief review of the emissions produced by domestic heating and motor vehicles, industrial air pollution and public awareness to the problem are discussed. Belgian and foreign legislation are cited. Much importance is given to the German legislation, in particular to the standards for the emission of several substances, as well as to the method for the calculation of stack height. Although there is a serious lack of legislation in Belgium, industrial pollution can be fought rather efficiently by local authorities. They can restrict the issuing of licenses. An Antwerp Control Agency can issue advise and study complaints. Attention is given to the difficulties in measuring the pollutants and the problem of the efficient removal of solid residues. A network of 180 stations to measure smoke and sulfur dioxide has been put up over the country to test the effectiveness of Belgium legislation.

14727 APTIC NO. 31822

Fromson, Jeffrey

A HISTORY OF FEDERAL AIR POLLUTION CONTROL. *Ohio State Law J., vol. 30:516-536, 1969. 155 refs.*

Anti-pollution legislation has had to develop within a polluted atmosphere of another sort: an atmosphere clouded by property concepts, legal barriers, and preconceived political values.

The legislative history of the Air Quality Act of 1967 is reviewed. The use of a nuisance law as a primary source of air pollution abatement is discussed and found to be wholly ineffective. Federal recognition of the magnitude of the air pollution problem came in 1955 with the enactment of a bill which provided research and technical assistance for the control of air pollution. The evolution of Federal involvement in air pollution control is discussed. Following the passage of the Clean Air Act of 1963, the focus of attention shifted primarily to the areas of automobile emission control and to more effective means of controlling air pollution at regional levels.

14728 APTIC NO. 32352

Gainer, J. G.

CANADIAN AIR POLLUTION REGULATIONS AND THE SOUR GAS PROCESS INDUSTRY. *Proc. Nat. Gas Processors Assoc., vol. 48-93-96, 1969. 7 refs. (Presented at the Natural Gas Processors Association, Annual Convention, 48th, 1969.)*

The evolution of air pollution control in the natural gas sulfur recovery industry in Alberta is reviewed, in the light of legislation and industrial developments which led to the Public Health Act and the Oil and Gas Conservation Act. Most control legislation is provided by regional governments; a small amount is provided by the federal government. In 1945, the first legislation was enacted in Alberta to evaluate complaints and to remedy the conditions where necessary. Later legislation governed the control of dust from piles of coal and slag, the authority to make regulations, the control of pipelines, and the control of new construction. Emission standards were established for smoke in urban and rural areas (with the Ringelmann chart), particulates, odors, and toxic materials. The Alberta Department of Health used two approaches to the general problem: the control of pollution at the source; the control by dilution in the atmosphere (tall stacks, meteorological control of process operations, and effective zoning). Air quality criteria were developed for sulfur dioxide, hydrogen sulfide, and sulfur trioxide for short and long terms and for populated and remote areas. All construction must be approved and monthly reports of atmospheric monitoring, plant operations, incinerator stacks, flares and flare pits must be made. Odors are controlled by incineration, pilot flames, settling ponds, vapor recovery, or weather. Comparative sulfation rates show improvement in air quality since the Health Regulations took complete effect.

14729 APTIC NO. 32009

Glenn, Thomas R., Jr.

PLANNING AND COORDINATION IN THE NEW JERSEY-NEW YORK-CONNECTICUT AIR QUALITY CONTROL REGION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1971. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-47.)*

The functions of the Interstate Sanitation Commission as the official planning and coordinating agency for the Federally designated New Jersey-New York-Connecticut Air Quality Control Region are reported. A discussion of the proposed model legislation to require mandatory reporting of breakdown or malfunction of air pollution control equipment, is included. A workshop sponsored by the Commission to update and strengthen criteria for an air pollution warning system and the plans of the Commission to assist in the development of compatible standards in the Region are reviewed, and the implementation plans for present and future standards, the continuation of the Federal-developed model for the air shed, and coordination of air pollution alerts are also discussed. (Author abstract modified)

14730 APTIC NO. 32002

Jones, Charles O.

FEDERAL-STATE-LOCAL SHARING IN AIR POLLUTION CONTROL. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 34p., 1971. 16 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-45.)*

The emergence of federal-state-local sharing of authority in air pollution control is described and the Clean Air Act of 1963, Air Quality Act of 1967 and Clean Air Amendments of 1970 are briefly examined to discern patterns of sharing authority. Several factors complicate the development of decisive, rational, and unambiguous policy: low level research commitment, limited communication of existing knowledge, a view air pollution control as a state-local responsibility, and a heavily-bureaucratized federal administrative apparatus, powerful economic interests affected by regulation, and low level public concern and support before 1969-1970. Because recent public pressure and interest have pushed beyond existing technology, information exchange, administrative and organizational capabilities, and political and financial support, a period of adjustment is expected which wil hopefully permit continued information gathering, stabilization or organizational relationships, and the building of a solid base of political support within the federal government. Future policy implications from the perspectives of industry and local, state, and federal agencies are considered emphasizing interrelationships of the various agencies and their probable functions in a maturing air pollution control sharing system. Also noted are such stress points as local adaptation of federal standards, the potentially awkward coordination role for states, the tendency for the regulated to capture the regulators at all levels, and the threat to industry of standards set without complete or accurate information. (Author abstract modified)

14731 APTIC NO. 31956

Keinhorst, Helmut

NOT WITHOUT COERCION AND CONTROL. *(Nicht ohne Zwang und Kontrolle). Text in German. Umwelt (Duesseldorf), 1(4):17-19, Aug. 1971.*

Present regulations pertaining to air pollution originated in the 19th century, and the 1959 law for modification of existing regulations did not take a new direction. It solely provides for imposing demands that existing plants improve and reduce their emissions. The law does not provide the personnel or instrumentation necessary to coerce industry into compliance. While suitable methods are now available for controlling dust emissions, the situation with regard to gaseous emissions is appalling. Due to the high costs involved for the removal of waste gases, industry has taken the easy way out and constructed high stacks instead of implementing real solutions. A power plant with a capacity of 2000 MW in one hour emits up to 1.5 tons of carbon monoxide, 20 tons of sulfur dioxide, two tons of sulfur trioxide, six tons of oxides of nitrogen, 1 ton of hydrocarbons, and 0.5 tons of soot.

14732 APTIC NO. 31856

Kittredge, George D. and Barry D. McNutt

ROLE OF APCO IN CONTROLLING AIRCRAFT POLLUTANT EMISSIONS. *Preprint Society of Automotive Engineers, Inc., New York and Dept. of Transportation, Washington, D. C., 30p., 1971. 9 refs. (Presented at the Aircraft and the Environment Conference, Feb. 8-10, 1971.)*

Some of the general results of a program initiated in 1967 for the characterization and control of aircraft emission are presented. To estimate ground level air pollution effects, landing-takeoff cycles were defined for the several categories of aircraft to include all operations at or below 3000 feet altitude. Daily pollutant emissions are given. These results were used to quantify pollutant emissions per unit time for the nation as a whole and for individual selected cities having FAA controlled airports. The masses of emission per day from aircraft are much less than other sources with respect to all metropolitan areas. The nuisance represented by the visible aspects of particulate emissions (smoke) cannot be ignored. The standardization and improvement of available emissions-measurement methods for characterization of aircraft exhaust composition were intensified. It was concluded that available measurement methods for characterization of hydrocarbon, carbon monoxide, carbon dioxide, and nitric acid appear suitable. Additional baseline emission data were discussed. Emissions from selected commercial aircraft are being measured, to provide better and more up-to-date emissions factors for newer equipment. Equipment and operation modification were also discussed. Legislation is pending to set standards and give the Air Pollution Control Office more responsibility.

14733 APTIC NO. 31930

McKee, Herbert C.

AIR POLLUTION CONTROL -- STATE OF TEXAS. *Natural Gas Processor Assoc., Tulsa, Okla., Proc. Nat. Gas Process. Assoc., Ann. Conv., 49th, Denver, Colo., 1970, p. 117-119. (March 17-19.)*

The legal authority for a state air pollution control program in Texas is contained in the Clean Air Act of Texas, originally passed by the Legislature in 1965 and subsequently modified in 1967 and 1969. This act establishes the Texas Air Control Board as the legal entity to develop a statewide program, and describes the powers and duties of the Board. Studies were undertaken to evaluate the complaints that had been received and to obtain other information so that the various problems could be identified and priorities could be established. The five regulations which resulted from these studies and are now in effect are described. Future regulations concerning emissions of carbon monoxide, oxidant, and hydrocarbons are also discussed. Long-range planning is considered.

14734 APTIC NO. 31746

Middleton, John T.

DIFFUSION MODELING FOR AIR POLLUTION ABATEMENT AND CONTROL. *National Air pollution Control Administration, Research Triangle Park, N. C. and North Carolina Consortium on Air Pollution, Proc. Symp. Multiple-Source Urban Diffusion Models, Chapel Hill, N. C., 1969, p. 1.1-1.7. (Oct. 27-30.) (APCO Pub. AP-86)*

NTIS: PB 198400

In the Clean Air Act, as amended, the Congress has attempted to give the National Air Pollution Control Administration the legislative apparatus that is needed to remove the malignancy of air pollution. As we proceed with the implementation of the Clean Air Act, the meterologist will be called upon more often to provide a mathematical description of the transport of air pollution in the research, survey, and operational phases of control activities. Diffusion models are the yardsticks for furnishing quantitative determinations of ambient air concentrations of pollutants. The hope is that by applying diffusion models to calculate the integrated effects of multiple sources of the same pollutant, we will be able to interpret the relationships between proposed or existing source emission standards and ambient air quality standards. Another application of diffusion models will come with the evaluation of the effectiveness of individual control or abatement procedures for a given source or complex of sources.

14735 APTIC NO. 31828

Morgan, G. B., E. C. Tabor, and R. J. Thompson

ATMOSPHERIC SURVEILLANCE -- PAST, PRESENT AND FUTURE. *Preprint, American Chemical Society, Washington, D. C., 23p., 1971. 17 refs. (Presented at the Symposium on Determination of Air Quality, Los Angeles, Calif., March 29-April 2, 1971.)*

Information provided by an adequate atmospheric surveillance system will contribute to the basis for control plans and finally indicate the effectiveness of control measures. Early surveillance programs are cited, while during the late 1940 s and early 1950 s, a tremendous effort was expended to precisely define the nature of the air pollution problem in the Los Angeles area. In 1953, the Sanitary Engineering Center of the Public Health Service, under a contract with the Army Chemical Corps, embarked on a program to measure the protein content of the air. This effort required development of a suitable sampling system to collect sufficient suspended particulate matter to meet analytical requirements. The unorganized increase in size of this network led to a plan called the National Air Sampling Network which provided for surveillance of all the major population centers and for one nonurban sampling station in each state. A major event in national air surveillance was establishment of the Continuous Air Monitoring Program in 1961. State and local air surveillance activities are mentioned, as well as current national surveillance in response to new legislation. Criteria documents have been issued on particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, photochemical oxidants, and hydrocarbons. Atmospheric pollutants now measured include the above and, nitric oxide, several metal compounds, methane, pesticides, and radioactivity. Further surveillance will be carried out by the National Aerometric Data Information Service which will use computer data analysis and various analytical and sampling methods.

14736 APTIC NO. 32085

Mottur, Ellis R.

TECHNOLOGY ASSESSMENT AND ENVIRONMENTAL ENGINEERING. *Preprint, Society of Engineering Science, Inc., Washington, D. C., 19p., 1970. 8 refs. (Presented at the Society of Engineering Science Inc., Annual Meeting, 8th, Washington, D. C., 1970.)*

NTIS: PB 197687

The significant role of environmental engineering in the resolution of the nation s social problems is defined. The nature and significance of technology assessment and the relationship of environmental engineering to technology assessment are examined. Environmental engineering and technology assessment are considered within the wider context of conversion of the nation s technical talent and resources from defense to civilian oriented programs. Two models for technology assessment are presented and analyzed: those starting from a particular technology or technological system and a problem-oriented technology assessment, i.e., with a general problem area as their starting point, e.g., air pollution. (Author abstract modified)

14737 APTIC NO. 32306

Murdock, John W.

PROPOSAL FOR AN INTERNATIONAL AIR POLLUTION INFORMATION ANALYSIS CENTER. *AGARD Conf. Proc. (Paris), no. 78:5-1 to 5-3, Feb. 1971. (Presented at the AGARD Technical Information Panel, Amsterdam, Netherland, Nov. 10, 1970.)*

NTIS, DDC: AD 719716

The establishment of an international air pollution information analysis center within the North Atlantic Treaty Organization is proposed. The application of information analysis concepts to the critical field of air pollution would create a comprehensive base of knowledge that would be utilized by research scientists of many nations to assure maximum effective contributions to solving air pollution problems and by administrators and policy makers to0 0 make the major decisions that determine what research is to be done and how it is to be funded. The center would use existing documentation services and computer data programs. It would also include a register of on-going research and development programs, air pollution laws and codes, a register air pollution personnel and a network with specialized collections and data banks.

14738 APTIC NO. 31957

Nagel, S.

FOURTH HEARING ENVIRONMENTAL PROTECTION: MAINTENANCE OF CLEAN AIR. DEBATE OVER DEADLINES FOR LEAD LIMITATION--NON-POLLUTING CAR IN FIVE YEARS. *(4. Hearing Umweltschutz: Luftreinhaltung. Tauziehen um Termine fuer Bleibegrenzung--Umwelt Auto erst in fuenf Jahren). Text in German. VDI (Ver. Deut. Ingr.) Nachr. (Berlin), 25(25):2, June 1971.*

On June 14, 1971, at the fourth public hearing on environmental pollution, experts testified that the air pollution in industrial centers in the Federal Republic of Germany had reached concentrations hazardous to human health. Air pollution has been proven to cause diseases of the respiratory tract and retard development in children. Urban atmospheres contain carcinogenic substance which procuce 2.27-3.8 times the incidence of cancer as in rural areas. Maximum emission concentrations have been established for pollutants such as nitrogen oxides, sulfur dioxide, hydrogen sulfide, chlorine, and course dusts. These standards must be periodically verified and updated. The automobile industry is now under pressure to construct engines with lower emissions of pollutants, so that, within three years, carbon monoxide and hydrocarbons will be reduced by 20 to 30%.

14739 APTIC NO. 32025

Norvell, G. Todd and Alexande W. Bell

COMMENTS. AIR POLLUTION CONTROL IN TEXAS. *Texas Law. Rev., vol. 47:1086-1123, 1969. 37 refs.*

Air pollution control in Texas is reviewed with special attention to state control. The legislative history, starting with the Nuisance Dotrine, is analyzed, and various cases decided under the doctrine are examined. The creation of the Texas Air Control Board is discussed with respect to the staff, rulemaking authority, variances, and adjudication and enforcement. Local control, in relationship to the board, and the impact of federal law on state actions are examined. Proposals to increase the effectiveness of the Control Board are presented.

14740 APTIC NO. 31999

Ohl, Rolf

THIRD REPORT ON THE ACTIVITY OF THE RESPIRATORY PROTECTION WORKING GROUP. *Atemschutz-Inform., 8(1):3-6, 1969. 4 refs. Translated from German. McElroy (Ralph) Co., 5p., Nov. 1970.*

NTIS: LA-4442-TR

The activities of the Respiratory Protection Working Group, part of the Medical Labor Protection Board of the Committee of Labor Hygiene for 1964-1968 are reviewed. Changes in personnel, inspections of respiratory protective devices at their place of usage, the respiratory protection symposium, consultation on research problems, and labor protection regulation are discussed. The respiratory research problems included breathing resistance, dead space, weight, and the influence of temperature and moisture of inhaled air. (Author abstract modified)

14741 APTIC NO. 31961

Persson, Goeran A.

MEASURES FOR THE MAINTENANCE OF CLEAN AIR. *(Massnahmen zur Reinhaltung der Luft). Text in German. Staub, Reinhaltung Luft, 31(7):283-284, July 1971. (Presented at the Weltgesundheitsorgonisation Symposium ueber die Ermittlung und Festsetzung von Luftqualitaetskriterien und Immissionsgrenzwerten, Geneva, Switzerland, Oct. 5-9, 1970.)*

Thery are two basic approaches to air pollution control: the best practical means approach and the air resource management approach. Minimum control requirements for single sources are based on the best practicable means approach. Its advantage lies in the fact that air pollution can be prevented even though there is only limited knowledge of pollution effects. However, this approach has the disadvantage that maintenance of emission standards does not always guarantee satisfactory air quality. It also prevents the development of new emission control methods, which is particularly pertinent to domestic heaters and automobiles. In urban areas, both approaches to air pollution control must be combined to assure satisfactory air quality. The long-term goal should be to achieve not only a tolerable level of air pollution but a desirable level.

14742 APTIC NO. 31849

Reilly, William, Clemens A. Lazenka, and Fredrick Voigt

PHILADELPHIA S EXPERIENCE IN THE CONTROL OF EMISSIONS FROM ASBESTOS SPRAY FIREPROOFING OPERATIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 32p., 1971. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th Atlantic City, N. J., June 27-July 2, 1971, Paper 71-52.)*

The multiple environmental health problems associated with the use of asbestos spray fireproofing and the administrative and legal steps taken by Philadelphia to control this problem are described. Medical studies documented a correlation between exposure to asbestos and mesothelioma. With this evidence, medical experts recommended zero emission from the use of asbestos as fireproofing for structural steel members in construction work. The Air Management Services worked with the construction industry in attempts to control the emissions from the spraying and related construction operations. This included the use of several types (fibrous and cementitious forms) of asbestos spray material and detailed procedures for the spraying operations covering methods for enclosures, mixing, clean up, disposal, and worker protection. It was also announced that no permits would be issued for the spraying of asbestos unless it could be demonstrated that it could be fully controlled. Another parallel and difficult problem is the demolition of buildings which contain appreciable quantities of asbestos construction or insulating materials. In these cases, control should be 100% containment of visible emissions. New demolition procedures must be developed to achieve this result. (Author abstract modified)

14743 APTIC NO. 32125

Rossano, August T., Jr.

THE COMMUNITY AIR POLLUTION SURVEY. *In: Air Pollution. Arthur C. Stern (ed.), Vol. 3, 2nd ed., New York, Academic Press, 1968, Chapt. 31, p. 597-637. 129 refs.*

In general, the air pollution survey concerns itself with a systematic study of a considerable segment of the environment to define the interrelationship of sources of pollution, atmospheric and geographic parameters, and measureable manifestations in order to evaluate the character and magnitude of an existing problem, to estimate the potential for future worsening, or to obtain the knowledge and understanding necessary for developing preventive and corrective measures. The design, development, and execution of the survey demand the imaginative application of many skills and professional disciplines. The objectives and purposes must be made clear from the outset and strictly adhered to throughout the course of the survey, particularly in the final stages of interpretation and reporting of the findings. Emission inventories, meteorological and topographic studies, air sampling and analysis, the measurement of effects, photographic studies, complaint studies, and opinion surveys, are discussed. Results of a well-designed air pollution survey can provide valuable data with which air pollution control administrators can make objective decisions on the long-range management of the local air resource. A list of the major air pollution surveys is presented tabularly. (Author summary modified)

14744 APTIC NO. 31837

Russell, Clifford S. and Walter O. Spofford, Jr.

A QUANTITATIVE FRAMEWORK FOR RESIDUALS -- ENVIRONMENTAL QUALITY MANAGEMENT. *Purdue Univ., Lafayette, Ind., Water Resources Research Center, Proc. Nat. Resource Systems Models Decision Making Seminar, Lafayette, Ind., 1969, p. 66-86. 4 refs.*

NTIS: PB 197111

A conceptual framework for a large scale, regional environmental quality management model is discussed. The model was designed to deal explicitly with the major forms of residuals -- airborne, waterborne, solid wastes, and noise. The model is divided into three parts: a linear inter-industry model reflecting choices among production processes and residual transformation and discharge activities; a set of environmental diffusion models describing the movement and degradation of residuals discharged into the atmosphere; and a set of receptor damage functions relating the concentrations of various residuals at points in the environment to costs and damages incurred by receptors. Thus, the model aims at an optimal selection of residual discharge levels from the production activities of a region. The computational procedure involved non-linear programming techniques and produced a residual discharge vector. This discharge set was used as input to the environmental/damage models. Then the newly evaluated marginal damages were returned to the objective function as shadow prices and the process was repeated. A didactic version of such a model employing a limited number of production activities and processes is discussed. (Author abstract)

14745 APTIC NO. 31873

Seamans, Frank L.

TORT LIABILITY FOR POLLUTION OF AIR AND WATER. *Natur. Resour. Lawyer, vol. 3:146-153, 1970.*

Air pollution cases involving damages evolve into two basic inquiries. First you must determine what effluent is involved. The second is to determine what is claimed to be harm. There are three theories on which tort suits are filed. The plaintiff may claim negligence, nuisance, or trespass. If a suit is filed on the basis of nuisance, it must be decided whether the nuisance is permanent or temporary. The lawsuit is a battle of experts. The use of maps and charts is also very helpful. The effect of air pollution statutes on tort liability has not yet been fully determined. Another increasingly important factor is what is going to be the effect of tort cases of evidence that the defendant polluter did not meet the test of standards in the state statute or in the regulations?

14746 APTIC NO. 31872

Verleger, Philip K. and Jennie M. Crowley

POLLUTION: REGULATION AND THE ANTITRUST LAWS. *Natur. Resour. Lawyer, vol. 2:131-141, 1969. 43 refs.*

The problems of air and water pollution are such that public interest demands that Government consult with industry and that competing interests in industry consult with one another. But antitrust enforcement agencies are suspicious of consultation. The collective discussions of advisory groups are always related to regulatory action. The object may be to avoid regulation; more probably, it will be to persuade the Government to levy its regulations in a periodical form. Thus, it is commonplace for the Federal Government and the State Government to authorize conduct by its agents which would otherwise violate antitrust laws. If the law is clear, it may be as anticompetitive as the legislature wills. Thus, the Government, even with the help of members of an industry, can design standards which foreclose a dealer from marketing particular products.

14747 APTIC NO. 31878

Walker, Matthew S.

LAWS, REGULATIONS AND ORDINANCES IN THE AIR POLLUTION FIELD. *Natur. Resour. Lawyer, vol. 3:74-80, 1970. 5 refs.*

When considering laws, regulations, and ordinances in the air pollution field, the only effective control that can be applied is at the source. Every proposed regulation on air pollution control should be analyzed on the basis of the cost benefit ratio. If air pollution is so rigidly controlled that it destroys the economic base of the community, the control program is not likely to be appreciated by those who have to go on welfare or move to some other community. In considering an approach to air pollution control, care should be taken not to blindly copy regulations from another jurisdiction. Enforcement of air pollution regulations by injunction is a popular and widely used measure. The enforcement by misdemeanor sanction is a popular provision in all regulations coming within the scope of police power. Another enforcement procedure is the assessment of a civil penalty against those responsible for emissions of air pollution. Some form of administrative review is essential to a well designed air pollution control program. The variance procedure makes it possible to have a strict ordinance that will do as much good as possible in those cases where control is feasible, and yet provide a legal and orderly method of making adjustments where adjustments are necessary.

14748 APTIC NO. 31874

Weakley, Leonard A.

INTERSTATE COMPACTS IN THE LAW OF AIR AND WATER POLLUTION. *Natur. Resour. Lawyer, vol. 3:81-89, 1970. 21 refs.*

Interstate compacts as a mechanism for the abatement of pollution were discussed. Effective solutions for interstate air and water pollution problems require the intervention of federal authorities or regional interstate cooperative action. Regional and interstate problems of all types were effectively solved in the past through the use of interstate compacts, a cooperative covenant between two or more states to settle particular difficulties involving the adjustment of political rights not susceptible to federal action alone. Legal aspects of interstate compacts fall into several areas of concern: source, character, and scope of authority for states to enter compacts; formation of compacts; administration of compacts; and enforcement of compacts. The compact clause of the Constitution does not specify the time or manner in which Congressional approval of a compact is to be forthcoming. Judicial support clearly establishes that compact is an effective tool for coping with air and water pollution abatement problems. Use of the compact device is not sufficiently expanded and not adequately implemented to demonstrate its full effectiveness.

14749 APTIC NO. 31848

Wiel, Stephen

A METHODOLOGY FOR EVALUATING LOCAL AIR POLLUTION CONTROL ADMINISTRATION EFFECTIVENESS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 44p., 1971. 29 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-121.)*

A methodology is proposed to assist in answering such questions as (1) the degree to which the existence and activity of a local air pollution control agency improves air quality, and (2) whether each of the various agency functions are necessary. Preliminary results indicate the feasibility of economically collecting data to mathematically describe the development and operation of local air pollution control programs. Using Los Angeles as an example, evaluators are defined and data presented for: inputs to the agency (money, technical information, and political support); output oriented agency actions (making new laws and regulations, enforcing laws, issuing permits, measuring air quality, controlling emergencies, disseminating information, and conducting research); and outputs of the agency (changes in emissions, ambient air quality, and social effects). Data are normalized on a per capita and per-ton-of-pollution basis to allow comparisons over time and between local agencies throughout the country. The evaluation procedure could provide management guidance for the operation of local air pollution control agencies, a procedure for Federal evaluation of the effectiveness of both local agencies and entire Air Quality Control Regions or state programs, one component of a model for evaluating proposed Federal control strategies, and a model for educational use in manpower training programs. (Author abstract modified)

14750 APTIC NO. 32163

Willens, Howard P.

THE REGULATION OF MOTOR VEHICLE EMISSIONS. *Natur. Resour. Lawyer, vol. 3:120-130, 1970. 16 refs.*

The antitrust validity of the automobile industry s cooperative efforts to solve the vehicle emission problem and the relationship between the Federal government and California in their efforts to impose increasingly stringent control on vehicle emissions were discussed. The growth of government regulation was reviewed. In 1955, automobile manufacturers entered into a cross-licensing agreement aimed at encouraging the free exchange of information among company engineers. As technical work progressed, California developed a regulatory structure for emission controls, once the technology permitted. During the 1950 s, California enacted basic legislation authorizing regulation of air pollution from all sources. The official interest of the Federal government manifested itself more gradually. The Federal Clear Air Act was enacted in 1963 and amended in 1965 to include automobile emissions. The Air Quality Act of 1967 supplemented the law applicable to motor vehicle emissions. Two significant issues arose recently regarding the regulation of motor vehicle emissions. The first pertains to the antitrust suit filed by the Department of Justice, and the second relates to the waiver of preemption procedure prescribed in the Air Quality Act of 1967. Looking ahead to more stringent new car standards, the basis and justification for such standards is becoming a critical issue for automobile purchasers as well as manufacturers.

14751 APTIC NO. 31751

Wilson, Edward F., William Reilly, John C. Donlevie, and Fredrick Voigt

USE OF LAW STUDENTS IN AN AIR MANAGEMENT PROGRAM. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1971. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-120.)*

During the autumn of 1969, Air Management Services of Philadelphia was in the midst of organizing a comprehensive enforcement program for implementation of the Air Management Code and Regulations. The Law Department was also under considerable demands for enforcement, straining the efforts of their existing personnel. During this period, Air Management Services was employing four law students. The students worked closely with the Law Department and as a result provided valuable assistance in the enforcement of the new Code and Regulations. The students required little supervision and within several weeks were developing legal briefs and memoranda based on extensive research. Their work was of excellent quality and required only minor editing. The students also researched general points f law to aid Air Management Services in the formulation of an effective program of enforcement. The result of this work was a core of basic research which enabled the City to gain the latest legal opinions from national sources without having to exhaustively research each jurisdiction. (Author abstract modified)

14752 APTIC NO. 32235

Zimmerman, Joseph F.

POLITICAL BOUNDARIES AND AIR POLLUTION CONTROL. *J. Urban Law, vol. 46:173-197, 1969. 116 refs.*

To be effective, an air pollution abatement program must concentrate on source control of pollutants. The cost of pollution control is directly proportional to the degree of abatement desired. Unfortunately, accurate cost data for the elimination of air pollution are lacking, resulting in industrial polluters being hesitant to initiate abatement programs in the absence of these valid cost data. Air pollution abatement programs also are hindered by the absence of accelerated depreciation allowances. The intense competition between the states for industry militates against the adoption of an effective air pollution control program. Public policy makers wrestling with the problem of air pollution are faced with the dilemma of desirable policy goals which conflict with each other. Artifical state and local political boundary lines unfortunately impose restraints upon the effectiveness of governmental programs designed to solve problems which do not respect boundary lines. The federal role in air pollution abatement is discussed, including the Air Quality Act of 1967. Air pollution in the New York metropolitan area and its interstate aspects are described. The Mid-Atlantic States Air Pollution Control Compact is mentioned, and the possibilities of interstate cooperation as required by the Compact are considered.

SOCIAL ASPECTS

14753 APTIC NO. 32443

Hirono, Tadashi

THE BASIC THOUGHT ON THE PUBLIC NUISANCE. *(Kogai mondai ni taisuru Kihonteki kangaekata). Text in Japanese. Imono (Foundry), 43(7):17-24, July 1971. 4 refs.*

The population explosion and urbanization in Japan are partial contributors to air pollution. The population has grown from 30-35 million 100 years ago to 105 million now. Modern technology includes power generation stations at the 1 million kW level, steel mills capable of producing 10 million t/yr, ethylene plants of a 300,000-ton capacity, and 500,000-ton tankers. The lack of social controls, e.g., sewer systems built into the economic system also adds to the pollution problem. Losses due to pollution are increasing and cost an extra $39.20 per household. Repair of damages due to pollution, e.g., corrosion, in industrial and public sectors in Osaka cost 8.96 million dollars. Japan has 14 major legislations concerning air pollution control. Industries and research programs are helped financially, in thy forms of loans or tax measures, to develop and install pollution control equipment. Global and ecological conditions demand stronger pollution control. Siting for factories, in industrial parks remote from residential areas or in underdeveloped regions, is discussed. The need for cheaper and more efficient control equipment, process modifications, technology assessment, and waste recycling is examined.

14754 APTIC NO. 31749

Neiberger, Morris

PROGRESS PLUS PROFITS PLUS POPULATION EQUALS POLLUTION. *National Air Pollution Control Administration, Research Triangle Park, N. C. and North Carolina Consortium on Air Pollution, Proc. Symp. Multiple-Source Urban Diffusion Models, Chapel Hill, N. C., 1969, p. 12.1-12.10. (Oct. 27-30.) (APCO Pub. AP-86)*

NTIS: PB 198400

It is suggested that the roots of air pollution and other insults to the environment lie in the three P s: Progress, Profits, and Population. The relationship of the air pollution problem to some broader aspects of society is considered. An area emission limit concept is discussed, which is most readily appreciated if one considers the present practice of expressing the allowable emissions in terms of the percentage of total concentration of effluent emitted from one source or the total emission from each individual source. For example, if a plant constructs a dozen more stacks, each emitting concentrations of contaminants individually acceptable, the total effect might well be to produce concentrations far in excess of air quality standards. To prevent such excesses, the limit must be expressed in terms of total emission per unit area, whether the emission originates from one source or many.

14755 APTIC NO. 31748

Rivers, Martin E.

GRADUATE LEVEL AIR POLLUTION TRAINING - A CONTROL OFFICIAL S ALUMNI EVALUATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 8p., 1971. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-167.)*

A critical evaluation of the maintenance of graduate training programs in air pollution control by a graduate of such a program was made. The origins of such programs were analyzed in relation to public awareness and government funding practice. The government spending policy can help compound the problems of manpower rather than solve them. A system of pre-enrollment screening was devised to insure the proper matching of student and program before training commences. Pre-enrollment screening would eliminate the expensive and wasteful ends of mismatched students and programs. An evaluation of specific course work was presented. The class project concept was a most useful learning project. Theoretical analysis of problems should be balanced with practical applications. The practicing graduate soon learns that he is going to have to adapt the theory to less than ideal situations. The professional nature of graduate programs can help in proper job placement upon graduation. The evaluation of students in a professional manner by the program director is of great assistance in taking the most appropriate employment opportunity. Graduate programs are a necessity, but a critical evaluation is needed to insure that they are relevant to their intent. (Author abstract modified)

14756 APTIC NO. 32391

Rivers, Martin E. and Benjamin Linsky

A PICTURE STIMULUS APPROACH TO VISIBLE AIR POLLUTION PLUME INVESTIGATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 30p., 1971. 5 refs. (Presented at the Air Pollution Control Association Annual Meeting, 64th, Atlantic City, N. J., June 24- July 2, 1971, Paper 71-145.)*

A possible method to determine public attitude toward visible air pollution emissions was investigated. Several alternate methods of bringing test group subjects into contact with visible emissions were investigated. An evaluation of the candidate methods yielded a slide presentation as the most feasible and effective. A collection of slides was made from which two tests were developed and tested on students. The first test involved a picture association technique in which several pictures of visible emissions were randomly placed in a slide presentation of various pictures. Without explanation of individual slides, subjects are asked to write down their first thoughts of each slide. The second test involved the simultaneous presentation of five slides depicting several sources of visible emissions with various degrees of opacity. Subjects are asked to respond to the slides by indicating which of the sources of emissions were objectionable. For the first test, 36% responded to the visible emission slides with some thought of air pollution. A comparison of percent responses of objectionability and certified Ringelmann number was made for each source depicted in the second test. Effect of setting of plume to its effective objectionability was also evaluated. Responses showed this to be an important factor. It was concluded that this is a valid method in determining the acceptability of visible air pollution plumes. (Author abstract modified)

GENERAL

14757 APTIC NO. 31876

Air Pollution Control Office, Research Triangle Park, N. C., Office of Technical Information and Publications

BERYLLIUM AND AIR POLLUTION: AN ANNOTATED BIBLIOGRAPHY. *Pub. AP-83, 75p., Feb. 1971. 107 refs.* NTIS: PB 198067

A bibliography containing 107 abstracts of documents and articles on beryllium was presented. An author index, a title index, a subject index, and a geographical location index follow the abstracts. The bibliography is broken down into the following subject divisions: emission sources, atmospheric interaction, measurement methods, control methods, effects on human health, effects on plants and livestock, standards and criteria, and basic science and technology.

14758 APTIC NO. 32254

Nordrhein-Westfalen Arbeits-und Sozialminister (West Germany)

THE SITUATION IN NORDRHEIN-WESTFALEN IN 1970 AND DEVELOPMENTAL TRENDS. *(Situation in Nordrhein-Westfalen 1970 und die Entwicklungstendenzen). Text in German. In: Reinhaltung der Luft in Nordrhein Westfalen, Essen, West Germany, Brinck and Co. KG, 1969, p. 75-83.*

The population density of the industrial regions of the state is 1300 to 3000 inhabitants per sq km. These regions are the home of 90% of all coal mines, 70% of the steel industry, 50% of the heavy chemical industry, and 35% of the refineries in all of West Germany. To the emissions from these industries must be added those from 5.5 million households and from 3.5 million automobiles. Since the introduction of mandatory certification of polluters, air pollution in the entire area has decreased markedly. The projection for SO2 emission in West Germany is that it will increase by about 25% until 1975 and from then on will decrease because of the construction of nuclear power plants. In the U. S., in contrast, SO2 pollution will double until 1980 because of widespread use of coal. Pollution trends will be further affected by the growth rate of the chemical industry, which will expand from an index of 100 in 1962 to an index of 320 in 1975. The importance of SO2 as a pollutant will diminish to be replaced by fluorine, hydrocarbons, chlorine, and odorous emissions. The emission of fine dust as a health hazard will increase and dust fall measurements will have to be supplemented by dust concentration measurements. The problem in the steel industry will be fine dust control; in the aluminum industry, fluorine emission control; in steam power plants, fine dust control; and in domestic heating, nitrogen oxide control. Pollution from automobiles is expected to increase until 1975, especially from nitrogen oxides.

14759 APTIC NO. 32010

Shah, K. S. and K. Vikram Rastogi

INDIA AND GROWING AIR POLLUTION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 26p., 1971. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-50.)*

Population and industrialization are the two vital factors responsible for increased air pollution in India. In the industrialized cities, the pollution caused by carbon monoxide, carbon dioxide, nitric oxide, sulfur dioxide, fumes, acids, particulates, and smoke is considerable. The various sources of pollution and their effects on the population, animals, and crops are classified, and data presented showing the amount of pollution caused by large, medium, and small scale industries, power plants, mining industries, and automobiles. There are no laws to control the pollution and there are no facilities such as instrumentation, research, and training available for research work. A few institutions are engaged in studying the pollutant concentration from various sources and efforts are being made to avoid the spatial concentration of industries. Citizens are now being made aware of the harmful effects of growing air pollution. (Author abstract modified)

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14504 APTIC NO. 31800

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14114 APTIC NO. 32052

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*14178 APTIC NO. 32317

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*14690 APTIC NO. 32485

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*14671 APTIC NO. 32089

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14187 APTIC NO. 32389
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14676 APTIC NO. 31814

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*14188 APTIC NO. 31890

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14516 APTIC NO. 32121

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*14189 APTIC NO. 32262

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*14371 APTIC NO. 32100

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*14114 APTIC NO. 32052

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*14223 APTIC NO. 32464

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Combustion, 43(2):6-11, Aug. 1971.
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14431 APTIC NO. 31760

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